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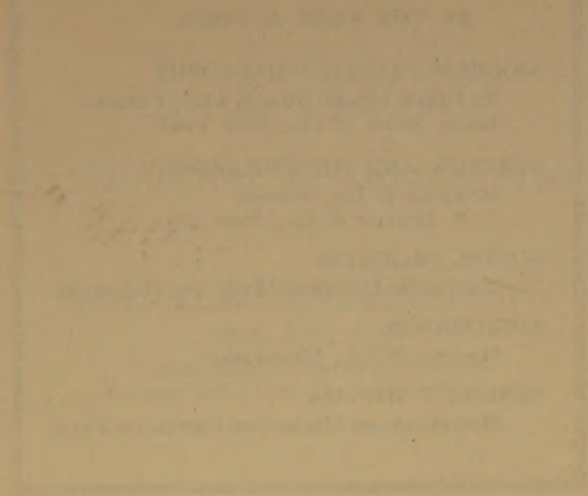
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Problem of time : an historical & critic



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THE PROBLEM OF TIME



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THE PROBLEM OF TIME

An Historical & Critical Study

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"If I were asked to name the most characteristic feature of the thought of the last twenty-five years I should answer: the discovery of Time. I do not mean that we have waited until to-day to become familiar with Time. I mean that we have only just begun in our speculation to take Time seriously and to realize that in some way or other Time is an essential ingredient in the constitution of things."

SAMUEL ALEXANDER (*Spinoza and Time*).

"Aucune question n'a été plus négligée par les philosophes que celle du temps, et pourtant tous s'accordent à la déclarer capitale. . . . La clef des plus gros problèmes philosophiques est là."

HENRI BERGSON (*Durée et Simultanéité*).

"Sodann taucht des Zeit-Problem in der Erkenntnistheorie auf. . . . Wirfte man die Frage auf, was die Zeit letztgultig für das Sein bedeute, so steht man mitter in Metaphysik. . . . Ist das ursprungliche Sein, ist die Welt in ihrer letzten Tiefe zeitlich oder überzeitlich? Und wie verhalt sich das Ewige zum Zeitlichen? Jede Metaphysik hat es in der einen oder anderen Weise mit dem Zeit-Problem zu tun."

VOLKELT (*Phänomenologie und Metaphysik der Zeit*).

"The problem is the central crux of philosophy."

BERNARD BOSANQUET (*The Meeting of Extremes in Contemporary Philosophy*).

"No philosophy can ignore the temporal quality of experience."

WILLIAM JAMES (*A Pluralistic Universe*).

"In any attempt to bridge the domains of experience belonging to the spiritual and physical sides of our nature, Time occupies the key-position."

EDDINGTON (*The Nature of the Physical World*).

"Attempts by contemporary philosophers of science to solve this problem would be more apt to become fruitful did they devote themselves to a more thorough study of the history of the concept."

E. A. BURTT (*The Metaphysical Foundations of Modern Science*).

PREFACE

WHETHER it be held, as Idealists claim, that the aim of philosophy is to find and define for man his place in the cosmos and his attitude to it, or that philosophy must abandon large synthetic speculations and devote itself to critical and analytical work, an examination of Time is imperative for the philosophical thinker of to-day. He may be inclined at first to lay it aside as an ultra-technical point which has little bearing on a general philosophy of life and things. But a study of Time is necessary for a critical and analytic philosophy; it is also the necessary introduction to any sound and synthetic attitude to the Universe and to the complex problems of human activity in its conflicts and its larger, nobler aspirations. It must be, in short, the foundation of any philosophy. In the present work we are primarily concerned with the nature of Time rather than with wider questions of its relation to freedom and value.

The work was planned prior to my departure from England in 1922. The original idea was discussed with Professor Alexander Mair, of the University of Liverpool, and I am deeply indebted to him for substantial encouragement, and for giving me the benefit of his valuable fundamental criticisms. His death, in October 1927, came as a shock to all his past students, and particularly to me. I had known him intimately for fourteen years, and his continued friendship in his letters during the five years prior to his death was one of my most treasured possessions. One of the last of his activities was the reading of the following work in manuscript, and approving of it for publication. His plans for publication and any final comments were cut short by his death. To those who were privileged to work under him his memory will remain as that of a great teacher of wide culture and a true friend.

My colleague, Professor W. R. Boyce Gibson, has kindly read some of the manuscript in its early stages and made helpful comments, especially in connection with the chapter dealing with Relativity. In connection with this chapter, I have also to acknowledge the exchange of views with Dr. E. J. Love, of the Department of Natural Philosophy in this University.

Two sections of the fifth and sixth chapters were delivered as papers to the First Congress of Philosophy in Australia, held in Melbourne in 1924, and the Second Congress in Sydney in 1925. At those Congresses the writer had the opportunity of obtaining the helpful criticism of Professor Bernard Muscio, of Sydney, on some fundamental points, which proved extremely valuable. The loss of so penetrating an intellect at the early age of thirty-nine has been a distinct loss to philosophy in this country.

Throughout the entire work my wife has rendered invaluable assistance with comment and criticism.

While I have derived inspiration from the French philosophers, with whom I have dealt in earlier books, especially those under whom I worked while at the Sorbonne, my debt to Kant, Sigwart, Cassirer, and to the British philosophers of to-day will be apparent to the reader. Professors Broad and Alexander have been foremost in this respect, although I have expressed differences from them both with regard to some aspects of the problem. The complexity and importance of the problem of Time for critical philosophy was shown to me in Broad's work in a manner quite different from that presented by my study of it in Kant or in Bergson, both of whom I found too subjective to be satisfactory. Alexander's published lecture on *Spinoza and Time* confirmed my own belief in the primacy of the Time problem for contemporary philosophy. At a later date Professor E. A. Burt's assertion of the need for a history of the concept was a further reassurance that such a work was imperative, although I was, and am, fully conscious that there are tremendous difficulties in presenting *any* doctrine of Time.

The field is beset with many metaphysical mantraps, with slippery paths, bogs, and thorny places. Many doubtful characters are met with by the pilgrim through the valley of "Time" as he approaches the hill Difficulty. Many Interpreters ask to be heard. There is Mr. Facing-both-ways, who professes to see both past and future. There is Giant Despair, who waves four different senses of "simultaneity" and two senses of "subjectivity" before him in order to puzzle him and allure him to Doubting Castle, where he is forced to believe that Time is nothing at all. There is Mr. By-ends, ready to say anything about it so long as it works. There is Hopeful, to whom the gates of the Future are wide open, but whose views

suffer from subjectivity, mental subjectivity. He will not believe what he has not himself lived and experienced. But those who proceed by inner sense lose their sense of direction in this world. They perish lamentably in the Valley of the Shadow of Objectivity. Some never set out on the great quest for they are entangled in a system of relations. Others rely upon their substance, others upon their measurements. Some, too, profess a belief in temporal signs, but verily no sign is given to them.

The selected quotations printed on the flyleaf of this volume are an indication of the growing recognition of the importance of the problem. In Germany, Marty and Volkelt have drawn particular attention to the whole subject in recent years, in addition to the special treatment of Cassirer. Further, Heidegger, the successor of Husserl, at Freiburg, has in the eighth volume of Husserl's *Jahrbuch für Philosophie und phänomenologische Forschung* (1927) contributed a lengthy discussion of "Sein und Zeit." In a later volume of the *Jahrbuch* (1928) Heidegger has published Husserl's Göttingen lectures on the subject given some years ago ("Vorlesungen zur Phänomenologie des inneren Zeitbewusstseins"). In France, Pierre Janet, of the College de France, has published his *Cours* of 1927-8 on *L'Evolution de la Mémoire et de la Notion du Temps*, in three volumes. They, of course, are written from the psychological view-point, i.e. they deal with our awareness of Time. From the physical standpoint, we have the recent Gifford Lectures of Professor Eddington, of Cambridge, *The Nature of the Physical World*. Some aspects of the problem have been raised at each important philosophical congress in recent years (e.g. at Oxford in 1920 and 1923, at Harvard in 1926, and at Bristol in 1928), and these papers have been published.

A critical history of the Concept of Time can make clearer the conflicting tendencies presented in the physical and psychological views, and help towards a clear conception of the nature of Time, which is a distinctly metaphysical problem. Such is the aim of this work in its critical as well as its historical treatment.

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VICTORIA, AUSTRALIA

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CHAPTER I

THE NOTION OF TIME IN GREEK PHILOSOPHY

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I

IN the Greek mythology Chronos was conceived as a being who begat children and himself devoured them. Thus the early Greeks pictured, in their vivid imagery, the constant becoming and transience of time, which has impressed the mind of primitive and modern man alike. Man finds himself in a world of change, a world of "coming into being and passing away". Change, succession, and transience are features, or at least appear as features, of man's environment. Throughout the development of human thought man has reflected upon, philosophized about, this environment of change in which he has found himself. But ever and anon he has striven to formulate for himself some conception of existence not to be entirely equated with the time-process of history. The universe of becoming, the world of events, is that which he knows by evidence of the successions around him. He has contemplated the possibility of, and realized, too, that experience of permanence, endurance, abidingness which is utterly different from the mere preoccupation or obsession with change.

Just as he finds that the history of his own personality involves a constant succession of events, but yet manifests a certain permanence, or unity, so he shapes his reflections upon time and contrasts the changing with the unchanging, the temporal with the eternal, the fickleness and transience of mere events with values which have their being in a reality in which there is no shadow of variableness, which is the same yesterday, to-day, and for ever.

This attitude is seen in the trend of human thought even before philosophical speculation grew up in the West. The Indian Upanishads and Vedas had outlined in the doctrines of Maya the transient appearance, and in Brahman the real, abiding whole. The thoughts which were given to the Eastern world five hundred years before Christ by the Buddha are an illustration of this tendency to escape the wheel of Time and his revenges, and to avoid the pain of the sheer flux of events in the time-process. The doctrine of Nirvana, whatever its cosmological implications may be, signifies at least this: an attempt to transcend the mere sequence of events and change by the soul.

In the sixth century B.C., when philosophy had grown up in the Greek world, we find the same problem brought forward even by the pre-Socratic thinkers. Heraclitus of Miletus delighted in laying stress on the reality of change and the unique importance of the time-process, which he likened unto a river into which no one could step twice. Events occur ceaselessly; they come into being and pass away. Time flies; change is constant and everlasting, πάντα ῥεῖ. Such was the doctrine of Heraclitus.

In opposition to it was then set up the Eleatic system of thought, which laid stress upon the converse propositions. To Parmenides of Elea change was not real. The real was abiding, permanent. In short, change, and along with it time, was an illusion. Ultimate reality was in character permanent and everlasting.

μόνος δ' ἔτι μῦθος ὁδοῖο
λείπεται ὥς ἔστιν· ταύτῃ δ' ἐπὶ σήματ' ἔασι
πολλὰ μάλ', ὥς ἀγέννητον ἔόν καὶ ἀνώλεθρόν ἔστιν,
οὐλον μουννογενές τε καὶ ἀτρεμές ἡδ' ἀτέλεστον,
οὐδέ ποτ' ἦν οὐδ' ἔσται ἐπεὶ νῦν ἔστιν, ὁμοῦ πᾶν
έν, ξυνεχές·

This is a clear statement of belief in monism and in an unchanging One. "There remains", he says, "only to give an account of One way, that Being exists indeed. Many directing posts stand upon it; because unborn, it is also indestructible, entire, only-begotten, unshakable, and everlasting. It never was and it never will be, since it is all of it together present in the Now as one and indivisible."

Zeno of Elea, by his famous paradoxes, including "The Moving Arrow", "The Story of Achilles and the Tortoise", and especially "The Stadium", showed the difficulties and contradictions which are inevitable if we endeavour to conceive of change as merely motion from one *point* to another in space, and in a time consisting of *discrete moments*. Zeno's difficulties occur again and again in the later development of thought in relation to Kant, Bergson, and Russell, as we shall show. These difficulties arise from failure to regard motion, space, and time as continuous. Melissos, who was also influenced by Parmenides, gave in his prose writings an exposition of the fundamental ideas of the Eleatic school of thought, and laid stress on the abiding quality of supreme reality, although he gave to his conception of eternity rather the sense of endless duration than the sense of pure timelessness, and failed, as did the others, to relate the permanent unmoving real, in which they believed, to the transient flux of everyday experience and events.

These two currents of thought, the Parmenidean and the Heraclitian, profoundly influenced subsequent thought in Greece and elsewhere. As we shall see in our later chapter on "Contemporary Metaphysics", Bergson and Bradley appear as the modern Heraclitus and Parmenides respectively, the one insisting on Change and Time, the other on Permanence and Timelessness. The Greece of the time of Parmenides was undergoing serious mental change. The older beliefs in the orthodox mythologies and tales of the gods were fading before the critical onslaught of argumentative Sophists on the one hand and genuine lovers of wisdom on the other. The masses were being influenced by vague exciting and ecstatic mystery religions like the wild worship of Dionysos and the Orphic cults of Onomakritos, both of which endeavoured to raise the soul of the worshipper above the transience of petty preoccupations to an experience transcending the sense of time in which an "eternal" union with the god would be mystically achieved.

The close of the fourth century saw the death of Socrates and the commencement of the work of Plato. It is in Plato that we find the Greek genius reflecting most deeply upon the problem of Time. He takes up the cudgels against Parmenides¹

¹ Plato, *Parmenides*, 141.

(in a dialogue bearing the name), whom he accuses of abstraction in his description of Being or the One. Parmenides' conception, argues Plato, would do away with all multiplicity, variety, relations, life, and time. The various forms of Time are discussed in conjunction with the significance of the existential use of the verb "to be". It is finally concluded against Parmenides that his monistic conception of Being is a mere abstraction. "The One", as so conceived, cannot possibly partake of Being, that is to say, it is wholly a fiction.

Plato enlarges upon his conception of Time in the *Timaeus*. He here distinguishes simultaneous existence, temporal in character, which goes through phases of futurity, presentness, and pastness. "Days and nights and months and years are all portions of Time." *Was* and *shall be* are forms of Time. We are wont (wrongly) to ascribe them to the Eternal Essence. Plato discusses the creation of the World, and says that "When the father and creator saw the creature (created thing) which he had made moving and living, the created glory of the eternal gods, he was delighted, and in his joy determined to conform his work to the original (eternal pattern or idea) still more, and as this was eternal, he sought to make the universe eternal, as far as might be. Now the nature of the intelligible being is eternal, but to attach eternity to the creature was impossible. Wherefore he resolved to have an image of eternity, which he made when he set in order the heaven moving according to number, while eternity rested in unity, and this image we call Time.

For there were no days and nights and months and years before the heaven was created, but when he created the heaven he created them also. They are all parts of Time, and the past and future are created species of Time, which we unconsciously but wrongly transfer to the Eternal Essence, for we say, indeed, that he was, he is, he will be, but the truth is that 'he is' alone truly expresses him, and that 'was' and 'will be' are only to be spoken of becoming in time, for they are motions, but that which is immovably the same cannot become older or younger by time, nor ever did or has become, or hereafter will be, older, nor is subject at all to any of those states of generation which affect the movements of sensible things. These are the

forms of Time when imitating Eternity and moving in a circle measured by number."

Time, then, he sums up, was created with the heaven,¹ and was framed after the pattern of the eternal nature that it might as far as possible resemble it, for that pattern exists throughout all ages, and the created heaven has been and is and will be in all time. Such was the mind and thought of God in the creation of Time. He made the sun and moon and five other stars, which are called the planets, in order to distinguish and preserve the numbers of time.² After this manner and to this end came into being such of the stars as in their heavenly progress had times of change, in order that the created heaven might be as like as possible to the perfect and intelligible being and imitate the eternal nature.

The truths of geometry and arithmetic in all their combinations remain unaltered by time. While men may come and men may go, while events come into being and pass away like the leaves of the forest, the mathematical laws by which the world works remain and appear incapable of change. Thus Plato regards Time as the moving image or shadow of Eternity, for the world-process displays at least some timeless features such as these eternal truths.

He seems more willing to admit the unreality of time than the unreality of space, which is for him eternal, while for modern thought the emphasis is rather reversed. Both space and time are, for Plato, the interposed links between the ideal and the sensible world. To the spectator of all Time and all existence, the true philosopher, the whole does not change and is timeless.

If time is not real or is merely subjective, then all that is contained in time seems unreal, the succession of ideas of human thought as well as the flux of sensations, and no link can be found between *φαινόμενα* and *ὄντα*, phenomena and

¹ Plato here says: "In order that being produced together they might be dissolved together if ever there was to be any dissolution of them." Thus although a little later he says the created heaven has been and is and will be in all time he cannot mean by this it may never end. He clearly contemplates such an end, and that end would involve also the end of Time. He thinks that if there were no events in the heaven there would be no Time. For scholastic philosophy (Aquinas) and the neo-scholasticism of Louvain (Mercier) in our own day real Time is the Time marked by the events of the heavens.

² Plato, *Timaeus*, 38.

noumena. Unless regularly marked by divisions of number, the course of time shares in the indefiniteness of the mere flux of Heraclitus.

In a later dialogue, the *Symposium*, Plato elucidates his conception of a Reality above the world of sense and ordinary perception. Into this eternal world the soul may, on supreme occasions, gain mystic entrance. It will then perceive real Being, real Beauty, glorious and everlasting, to be adored only by what Shelley would style "a Hymn to Intellectual Beauty". It is such a hymn as this that Diotima sings when she speaks of an Eternal Beauty, neither growing nor decaying, but existing, αἰὲν ὄν καὶ οὔτε γιγνόμενον οὔτε ἀπολλύμενον.¹ This Eternal Beauty or Love is timeless and changeless. "Time doth not breathe on its fadeless bloom." It is, however, mystic in character, remote and far beyond our mundane, everyday, habitual experience.

In spite of his reference to a quantitative factor, namely number, Plato does mention the fact that the image (of time) is moving. He realizes that time is essentially bound up with motion and change. His own philosophy reveals his position in relation to his two predecessors, Heraclitus and Parmenides. While rejecting the extreme doctrines of both of these thinkers, he nevertheless inclines to regard Parmenides as nearer to the truth in his description of ultimate reality. Heraclitus is right, too, in his insistence upon change, but, urges Plato, his world is not the *true* world of *reality*; it is the world of sense and of everyday perception, a world of constant flux and succession, mere temporality, not the world of abiding forms, ideas, worth, and values, which is Eternal. For Plato, time is a corruption of Eternity as Becoming is a corruption of Being. Time is regarded as the form, sign, and measure of the impermanence of the imperfect. Presumably, if the Perfect were fully manifested to us Time would vanish.

Plato's philosophy is of value in that it raises the problem of the permanent. The Real is for him permanent, and so Time is contained within the Absolute. The whole is timeless. He tends, however, to associate time too definitely with motion and with number, and to transfer timeless values and meaning out of the world of events altogether by his separation of Temporal and Eternal Worlds.

¹ Plato, *Symposium*, 211, a.

II

The idealism of Plato had, nevertheless, a basis of positive realism. The Academy was intent on learning from observation what the laws of Nature are. It is a superficial and quite false view of Greek Philosophy which tends to look upon Plato's work as purely idealistic while giving to Aristotle a realistic character which his work did not possess. In many respects, and from the point of view of the development of science, Aristotle was reactionary, and the dogmatic acceptance of his work in the Middle Ages, together with the loss of the researches of Plato and his disciples, was unfortunate. For example, Plato, following previous investigators,¹ taught that the brain was the central sensorium of the nervous system. Aristotle reverted to the older view that it was the heart. Again, to take a point nearer to the problems of motion and of time, Plato and his pupils considered the earth to move round the sun, but Aristotle rejected this in favour of the more primitive belief that the sun went round the earth.

Aristotle regarded Nature as a process involving constant motion or change. As he saw that motion involved space and time, he gave considerable place in his writings on the *φύσις* (Physics) to space and time and the continuity we must ascribe to them in view of the process of continuous change. Aristotle is untroubled by the discussions of a later age, which asked if time is real or only an appearance, just as he is untroubled by the question whether time is purely subjective or objective. The distinction did not occur to him, and there is little doubt as to how he would have answered such a question. He could never have conceived of time as subjective. While he believed in the reality of change in the Universe, he was no Bergsonian, who looked upon time as merely subjective. Just as he assumes quite simply and naturally that things and events really exist, whether we happen to perceive them or not, so he assumes that the time in which they happen is a real feature of a world which does not depend for its existence upon our perceiving it. Aristotle made no mistake about confusing time on the one hand and our awareness of it on the other.

¹ Alcmaeon of Crotona and Hippocrates.

In his exposition of Time in his *Physics* he lays down the view that time is inseparably connected with motion or change. We only perceive, he considers, that time has elapsed when we perceive that change has occurred. Nevertheless, time is not identical with change or with motion. This is seen by the fact that motion may be slow or fast, i.e. there may be different rates of speed, but the fact that we can compare these differing velocities implies that they are not different velocities of time.

Time is not motion, but it is that in terms of which we measure motion; it is, to quote his phrase, ἀριθμὸς κινήσεως κατὰ τὸ πρότερον καὶ ὕστερον ("the number of motion in respect of before-and-after").¹ "Number" here refers to that which is numbered, not the pure number by which we count. Time is, for Aristotle, the numberable aspect of movement. "There is", he says, "one single and invariable time which flows in two movements in an identical and simultaneous manner; and if these two sorts of time were not simultaneous they would, nevertheless, be of the same nature. Thus in regard to movements which take place simultaneously, there is one and the same time whether or no the movements are equal in rapidity; and this is true even if one of them is a local movement and the other an alteration. . . . It follows that even if the movements differ from each other and arise independently, the time is absolutely the same for both."²

Time, in Aristotle's view, contains within itself distinctions which can be recognized and counted. It is bound up with motion, for although the term κίνησις can be interpreted to include not merely change of place but also change in quality, nevertheless the "before and after" representations are analogous to the "here and there" of a body in motion in space.³ Extension, or magnitude, motion and time are bound up with one another. In particular, motion and time are intimately connected, and Aristotle regards time as the "number" of the movement (φωρά) in which the present is borne along. The present moment is the same eternal now, the same in the sense that it is always that which we immediately experience,

¹ Aristotle, *Physics*, IV. 11.

² Ibid., *Physics*, IV. 14.

³ It is interesting to compare in this connection a statement made in modern times by Lobachewski who wrote: "The motion of one body, if it is taken as the measure of the motion of another body, is called time."

but it is, on the other hand, always different because of the perpetual flux, motion, or change of events. Aristotle grasped the truth of the interconnection of time and change. He saw, too, the paradoxical nature of the durational and fleeting elements of our temporal experience as he became aware of the contradictions contained in the explanation of motion or change in relation to the being of the *present*, which, while it perpetually abides, perpetually moves on.

Time for Aristotle is that by which we estimate the duration of processes. When we count two minutes or two days as required for any process to be completed, we are counting units of something, and that something is time.

Each "now" is the end of past time but equally the beginning of a future. He recognizes that no line is merely made up of points and no time is made up of "nows". We always perceive a certain quantum of time.

Aristotle discusses in what sense a thing can be said to be "in time". This may mean one of three things: firstly, to be when time is; secondly, to be a part or attribute of time; thirdly, to be measured by time. He then objects that to be in time is not to be when time is, any more than to be in movement or place is to be when movement is. Past, present, and future are in time, since they are parts of it, and events are in time as being measurable by it. Things that always are, are not in time, for they are neither contained within nor measured by time. Time is the measure of movement and also the measure of rest. Only things in movement or in rest (i.e. which may be movable) are in time. Necessary truths always are, and so are timeless.

From the conflicts of the physical description of time and motion, which are of an objective character, Aristotle turns to a subjective point of a metaphysical kind by raising the question whether time is conceivable apart from mind and soul. If, he urges, nothing is capable of measuring except soul (mind or intellect), then, if there were not soul there would not be time, unless motion is possible apart from soul. For him motion is impossible apart from soul and demands a prime mover, an initial Nous or Mind. Change is spoken of as being sweet to men because of a certain defect in us. Real pleasure lies rather in constancy than in motion. Pleasure, we are told, is a function

of *ἐνέργεια*, or activity. The highest form of this *ἐνέργεια* is found in the Divine Activity, which is solely that of thought thinking itself in an Eternal self-contemplation, or *νόησις νοήσεως*. This activity is timeless in both the sense that it is everlasting and that it is apart from the process of events.

He does not really answer his own question about time in relation to soul. What he seems to mean is, if there were no one to count or number motion, how could there be time? This would raise the problem of subjectivity and objectivity, but he diverges from this to another metaphysical point altogether, the relation of motion to a prime mover.

It must be pointed out in criticism of Aristotle's view of time that by "number of movement" he must mean "motion". But time cannot be simply equated with movement, for movement implies time and cannot be synonymous with it. Again, time cannot be merely defined as before-and-after, for these are temporal relations. Probably Aristotle meant that the perception of succession was the immediate data from which our time experience is built up. It is the experience of movement and change in general which shows us time, for this we do not perceive directly but by means of events.

Aristotle recognized that the continuous change of the universe implies continuity of time. For him, however, continuity means the same as our later phrase, "infinite divisibility". He appears to hold both the view that there are indivisible units of time and that time is made up of successive "nows". He saw no difficulty in viewing time as continuous like a line, while holding at the same time the view that it is made up of "nows". This being so, he can hardly have meant the "nows" to be moments having no duration, but to be amounts of time. He does not make clear, however, that he has considered the relation between the views that time is continuous *and* infinitely divisible *and* made up of successive durations. These points could only be developed in relation to a discussion of objective time and our perceived time, but *this important distinction of Time as concept and as percept Aristotle does not draw.*

III

After Aristotle we find scattered reflections upon the subject of Time in the writings of the Stoics, the Hebrews, and the Hellenistic writers. For the Stoic, with his belief in an approaching conflagration, the universe resolved itself into a rhythm of cycles, each age ending with an ἐκπύρωσις. To what extent the logos, or first principle, conceived as bound up with fire, was also bound up with time, is not made clear in the Stoic doctrine, which upon all matters other than the preaching of austerity and the cosmopolitan unity of human society was exceedingly vague, especially on the metaphysical side. The Stoics identified time with motion (κίνησις), a view which was later criticised by Plotinus and Augustine, who claimed that motion was itself in time and that time was a constant but motion a variable. For Eratosthenes and Hestiaeus of Perinthus, time was equivalent to τὸ κινούμενον (that which is moved), while the Epicureans looked upon time as a mere accident, σύμπτωμα (or consequence) of motion. Epicurus' views were set forth by Lucretius in his great poem, *De Rerum Natura*. He there suggests a rather relativist doctrine, which sounds quite modern. Time, in his view, has no existence of itself, but only by means of material objects. (He does not, like Whitehead, say by means of events, but he improves on his first statement by bringing in a subsequent mention of motion.) Thus we get, he claims, our ideas of past, present, and future. *It is impossible to conceive time in itself independently of the movement or rest of things.*¹

The age of Epicurus was an age of mental conflict and chaos. Various independent philosophies and religions were coming prominently before men's minds in Greece, Rome, Judea, and Egypt. Hellenism, Platonism, Judaism, Christianity, Mithraism, Epicureanism, and Stoicism had their disciples and propagators. Occasionally blends of two or more of these tendencies appeared. Christianity blended with Judaism in the mind of Paul, Platonism and Christianity united to influence the author of the Fourth Gospel to write his philosophical introduction beginning Ἐν ἀρχῇ ἦν ὁ Λόγος, while Judaism and Hellenism

¹ Based on lines in *De Rerum Natura*, Bk. I.

combined in the work of Philo, the Alexandrian Jew. His own Scriptures contain some references to our problem in relation to the Deity. The ability of God to see Time and History in a perspective different from our own was evidently in the mind of the Hebrew poet when he exclaimed that "one day is with the Lord as a thousand years, and a thousand years as one day".¹ The Hebrew gained a conception of eternity by reflection on the One Divine Being, timeless and unchanging, while the Greek arrived by a metaphysical road at a similar concept. There is also evidence in the later and apocryphal writings that the merely quantitative conceptions of life and the universe were being replaced by qualitative ones. Philo explicitly states that the Deity is "withdrawn from both ends of Time". He regards the Divine Life as eternal, not temporal, and points out that in Eternity there is nothing past and nothing future, but only present, but remarks, in a tone which re-echoes Plato, that Eternity is the archetype and pattern of Time. How this can be, if one involves utter simultaneity and the other succession, he does not attempt to make clear. In his view Time was created with the world, as in Plato. The world and Time are regarded quite definitely as having had a beginning, but Philo affirms that they have no end. Doubtless he made this affirmation on the same ground as Kant, in his antinomy, namely that, given a series of events, we may conceive them as never ending; we cannot so well conceive them as never having begun.

The Christian doctrines did not, as first preached, elaborate any metaphysical or even theological system. These developments came later. There is, however, to be noticed a strong insistence on the qualitative side of life rather than on the quantitative and spatial characteristics. Neither abundance of possessions nor length of days is good in itself; it is the quality of the life which gives it worth and meaning. This meaning is timeless and of eternal significance. We are reminded that the highest form of life rises above the mere obsession with the events of the time-process, and are shown that

. . . in short measures
Life may perfect be.

¹ Psalm xc. 4.

In the third century of the Christian era we find the Neoplatonist Plotinus, in his *Enneads*,¹ bringing to a further stage the initial abstractions of Parmenides, Plato, and Aristotle. Plotinus was one of the greatest minds the world produced from the death of Aristotle to the birth of Descartes. He takes up critically the view expressed by Aristotle. His Neoplatonism leads him to regard Time as in some way an image of the Eternal. He refuses to identify time simply with movement, for all movement (or all movements) happens in time. "Movement time cannot be—whether a definite act of moving is meant or a united total made up of all such acts, since movement in either sense takes place in time. And, of course, if there is any movement not in time the identification with time becomes all the less tenable."² Movement, he explicitly states, must be distinct from the medium in which it takes place. Again, as he points out, movement can come to rest, but time is continuous. In his view *Time is a continuum in which events happen*. The events do not create time. Their existence, their happening, is conditioned by it. Time is thus an ultimate datum of existence, for the soul cannot create time by acting purposively. Time is given, and is the medium in which we realize our purposive actions. There is thus established a definite objectivity in regard to time.

Time is contained in the differentiation of Life, for "the ceaseless forward movement of Life brings with it unending time, and Life as it achieves its stages constitutes past time". Life in repose is Eternity, a condition in which there is no diversity of things or of events. Time originated with the sensible Universe and its changes, for the Universe, as he puts it, is a content of Time. The activity of the Universe, he says, in one almost Bergsonian phrase, is Time.

Time is not number, nor is it movement or a measure of movement. It is unique. Truly it serves towards measurement, but is not itself a measure; it merely incidentally exhibits the magnitudes of movement. Order and change exhibit time to us, make it a subject of knowledge, but they do not produce it.

"Time," Plotinus says, "still non-existent, reposed in the bosom of Reality until Nature, wishing to become its own

¹ Plotinus, *Enneads*, III. 7, 11; also Inge, *The Philosophy of Plotinus*, Vol. I.

² *Ibid.*, III. 7, 8.

mistress and to enter into possession of itself and to enlarge the sphere of its activities, put itself, and time together with itself, into motion. For the nature of the soul is restless; it desires always to translate what it sees in the Eternal World into another form." The essentially Platonic element is here apparent. For Plotinus, as for Plato, Time is an image of Eternity. It arose through a desire of the World-Soul to exercise its powers. Time is the form which this World-Soul creates when it desires to reproduce the eternal ideas as actual living and creative activities in themselves.¹

Plotinus believes in a One who is timeless and remote from the changes of the World.² Indeed, in his opinion, "to exist in time is to exist imperfectly". Time is for him generated by the restless energy of the soul, which is perpetually striving to express in matter the infinite eternal fullness of being. In a constant process of novelty the World-Soul produces succession; it being unable to manifest its Being, as it were, all at once, it is obliged to accomplish this by means of succession. According to this doctrine Time is a function of the life of the soul, while Eternity, in contrast, is the mode of the life of full Being, which ever is existing without variableness or shadow of change, like the One of Parmenides. The Unity of all things, Reality itself, is changeless and timeless. The view of Time outlined by Plotinus anticipates, as Inge has pointed out, some of the best thought of our contemporaries, and merits attention because it is illuminating and instructive. He saw clearly that to ask questions about Time is to raise problems about Reality. He grasped the fact that Time must at least be accorded *the reality of being in the nature of things*, and is a necessary form of our thinking things. Yet he considered Time is not itself Reality, for we transcend it. The soul transcends space and time because its home is not in the world of space and time; it is not actually in space and time at all (he held), but they are fields for its effort and activity.

πρῶτον μὲν ἑαυτὴν ἐχρόνωνσεν ἀντὶ τοῦ αἰῶνος τοῦτον ποιήσασα·
 ἔπειτα δὲ καὶ τῷ γενομένῳ ἔδωκε δουλεύειν χρόνῳ.³
 ἄχρονος πᾶσα ἡ νόησις.⁴

¹ The Eternal Ideas become or produce what Fouillée styled *les idées forces*.

² *Enneads*, III, 7, 11. See also Inge, *The Philosophy of Plotinus*, Vol. I.

³ Plotinus, *Enneads*, III, 7, 11.

⁴ *Ibid.*, IV, 4, 1

The philosophy of Plotinus is founded on a recognition of (1) existence (the universe as given); (2) awareness (our judgments of that universe as existing and as possessed of certain characteristics, arrived at by acquaintance, description, or logical inference); and (3) value (ideal good, to the recognition of which we are impelled by our nature). These values do not merely exist; they persist; they are there at any time. They are supra-temporal but not non-temporal in character. Phenomena reveal these to persons, and these values alone are reality. Mere existence is not, but the "real" values are. They can be attained or rejected by man, but they are realized in and through time, for all purposive activity implies time.

Time thus appears as a form of willed change and as a teleological category, a medium in and through which ideals are realized or work themselves out. The time-process may not be necessary for God's self-realization, but it is the product of His free but necessary creative activity. Ends and purposes are striven for in time, but the ends or ideals are not themselves in time. In the life of the spirit the time-process is transcended and the soul participates through purposes and ideals in the eternal meaning and value of existence.

There are some shrewd remarks about Time given in the *Enneads*, which are independent of his Platonic idealism and are of special importance to our problem. Plotinus distinguishes movement and time and disagrees with any definition of time merely in terms of *measurement* of any kind. He shows how Aristotle tended to confuse movement measured and the measuring magnitude. In any case, he says, these views imply a measure outside of what is being measured, and there is no adequate ground for introducing such a measure. It could in any case only be an abstract symbol of movement, and numerical values can never truly express movement or time. Sometimes one might think that Plotinus was writing with the modern mathematical physicist (whose main interest in Time is a measuring one) before him.

The measurement of a quantity of time does not help us to know its nature; we are no nearer to knowing the nature of the thing of which we say we have measured a quantity. Not only is measurement not necessary to its existence, but the problem of measuring *leaves its nature entirely undiscussed*. Plotinus

has laid his finger on several crucial points. Time is other than measurement or number, whether the attempt be to measure movement in general or part of the track of some movement. Time is not a quantity of space traversed, and the whole of Time we cannot measure. He recognizes time as objective, not merely subjective. He realizes the futility of equating time with movement because we cannot legitimately (as Poincaré pointed out) have it both ways; time cannot be a measure of movement and then itself be measured by movement. This point is crucial as we shall see in our later discussion on "The Physicists and the Problem of Measurement". Plotinus is on solid metaphysical ground in his contention that the problem of measuring time is a physical one and has little or no bearing on the metaphysical question of its nature.

CHAPTER II

MEDIAEVAL CONCEPTIONS OF TIME

Augustine acknowledges the difficulty. Objective and subjective problem. Augustine turns from metaphysics to psychology. Substitutes discussion of memory and anticipation for past and future. Early error of equating time with our awareness of it. Boethius and the *totum simul*. Teaching of Aquinas. Relation to Aristotle's view. His doctrine of *aevum* in relation to Time and Eternity. The antinomy. Has Time a beginning? Time and Mind. Jewish and Arabian contributions. The psychological *v.* mathematical view.

I

CHRISTIAN thought has found itself in a difficult position in regard to this problem of Time. On the one hand it has felt the tendency to look upon the Deity as remote from the world, or at most condescending to send a messenger to it. On the other hand it has taken the crucifixion of that messenger to be a symbol of the eternal crucifixion of the Deity who knows, feels, and laments the events of the time-process.

The majority of the explicit references to Time in the Christian writings occur, naturally enough, in discussing the nature of the Deity. Some of these have been influenced by Plato and Neoplatonic thought. Among early writers of note is Augustine. His discussion of Time and its nature in his *Confessions* and his *Civitas Dei*, although naïvely written, still merits re-reading. His very simplicity makes us pause, and, if we care, carry our thought over into fundamental considerations. His first "confession" is the very proper one of a recognition of the difficulty of the subject: "Quid est tempus? Si nemo a me quaerat, scio, si quaerenti explicari velim, nescio."¹ What is Time? "Who", he asks, "can readily and briefly explain this? Who can even in thought comprehend it so as to utter a word about it? But what in discourse do we mention more familiarly and knowingly than Time? And we understand when we speak of it; we understand also when we hear it spoken of by another. What, then, is Time? If no one asks me, I know; if I wish to explain it to one that asketh, I know not."

Augustine considered, like Plato, that Time had been created

¹ Augustine, *Confessions*, Bk. XI. 17.

by God at the creation of the world.¹ "Non in tempore sed cum tempore finxit Deus mundum," he remarks, repeating a thought derived from Plato's *Timaeus*. God is the creator of the World and of Time. The World and Time had one beginning; one did not anticipate the other. The World was not begun or created in any period or place of time, but simultaneously with Time. The sequence of events, movement, and change gives us time, so that creation and time have one and the same beginning.²

Time cannot, however, be explained entirely objectively, although it is undoubtedly objective, for it is measured by the soul. Augustine contributed to the psychological treatment of the problem, and by transferring his references from the world soul to the human soul opened up the discussion of our actual experience of time, which is a fundamental psychological investigation. There is a present of things present in immediate attention or perception, a present of things past in memory and a present of things future in expectation or imagination. This is the subjective, psychological view of time which makes it a function of consciousness. Yet Augustine, in stating that Time was created by God, expresses his belief in an objective time-order, but he does not show the connection of this with the soul-order, which is subjective in character.

Augustine's inquiry contained in the eleventh book of his *Confessions* shows us a mind which had not, of course, inherited the advantages of the modern psychological or metaphysical discussions of the problem, but yet a mind keen to understand the nature of this perplexing feature of experience. "My soul is on fire", he declares, "to know this most intricate enigma."³ He is at least penetrating enough to be aware of most of the problems, and to raise them even in a rather naïve way with curious quotations from the scriptures to eke out his own language and with frequent supplications to God to grant him more light on the subject.

He perceives time "to be a certain extension", and grasps the fundamental fact that we always experience amounts or durations of time. The suggestion that time is to be equated

¹ Augustine, *De Civ. Dei*, Bk. XI. 5.

² Ibid., *De Civ. Dei*, Bk. XI. 6.

³ Ibid., *Confessions*, Bk. XI. 28.

with motion he examines and expressly rejects. There may be times of rest or repose, he objects. Also he sees that we use time to measure motion, and so we cannot well use motion to measure time. This point is very similar to one made by Plotinus and later by Poincaré, and suggests the whole difficulty of any measurement of time.

The relations of past, present, and future he discusses in a way which brings out the unreality of the past and of the future relative to the present, together with the instantaneous character of the present. He sees time to be essentially an everchanging present, although we cannot *perceive* it as instantaneous. The phrase "the specious present" was unknown to him, but he grasped the fact of experience which that phrase expresses while quite conscious of the fact that objectively the present is not really such as the perceptual doctrine of the specious present represents it to be.

Periods of time like years, months, days, and hours can always be subdivided, "Yea, the present hour passeth away in flying particles." "If", he adds, "an instant of time be conceived which cannot be divided into the smallest particles of moments, that alone is it which may be called present which yet flies with such speed from future to past as not to be lengthened out with the least stay. For if it be, it is divided into past and future. The present hath no space."

For this reason he considers it impossible to measure time, because we cannot measure the present, which is instantaneous and fleeting, and we cannot measure the past, as it is gone. He admits that we endeavour to compare times, but for this he refers us to memory, not to mechanical means. The chronometer and other registering implements were not available for him, and he measured hours himself by a water-clock, hence his reference to 'drops of time'.

His discussion (which sounds particularly quaint to modern readers) of the duration of the battle in which the sun was said to stand still is not without its interest, for it shows that Augustine saw that the heavenly bodies are merely our *conventional measure* of time. He affirms that the battle had a duration in time unaffected by whatever the sun did—that is to say, he grasped the fact that time is given in the duration of *events themselves*, whether *measured* by the sun or not. "I heard once", he writes,

"from a learned man that the motions of the sun, moon, and stars constituted time, and I assented not. For why should not the motions of all bodies rather be times? Or if the lights of heaven should cease, and a potter's wheel run round, should there be no time by which we might measure those whirlings?" And in the next paragraph he asserts: "Let no man, then, tell me that the motions of the heavenly bodies constitute times, because when at the prayer of one the sun had stood still till he could achieve his victorious battle; the sun stood still, but time went on. For in its own allotted space of time was that battle waged and ended. I perceive time, then, *to be a certain extension.*"¹

He reverts unfortunately, however, from the difficulty of defining time objectively to psychological questions about our awareness of time. Memory he again refers to as the basis of our concept of time. The present is the instantaneous happening. The past, while it is objectively no longer real for us, persists in memory. Similarly there is, he notes, "in the mind an expectation of things to come". By anticipation we posit a future, and by the union of past and future through a fleeting present we form a conception of time which is given in the nature of things and is only possible by events, or the happenings of "created being". "Time", he remarks in his *Civitas Dei*,² "could not have been, had no creature come into existence which should vary by some change."

Like Plotinus, he conceives of a Being who is timeless. "For the eternal, properly speaking, there is neither any thing past as though it had passed away, nor any future thing as though it were not as yet, but whatsoever is, only is." Time, as for Plato and for Plotinus, is a creation of the World-Soul, or Creative One, who is for Augustine, of course, God. The continuous change or happening of events he recognizes as the basis of time, but behind all this flux of happenings abides an unchanging One who is not in time, so that for Augustine, as for Plato, time is not an attribute of the ultimate reality.

Augustine's metaphysical views are a development of Plato and Neoplatonism, but he begins a psychological discussion of the precise nature of the present as perceived and raises

¹ Augustine, *Confessions*, Bk. XI. 29, 30.

² Ibid., *De Civ. Dei*, Bk. XI. 6; and *Confessions*, Bk. XII. 29.

problems about the sequence of past, present, and future which mark a distinct advance in the discussion of our problem on the *limited* side of subjective time. "If", he notes, "nothing passed away, there would be no past time; if nothing were to come, there would be no future time; if nothing were, there would be no present time. Yet those two times, past and future, how can they be, when the past is not now and the future is not yet? As for the present, if it were always present and did not pass over into the past, it would not be time but eternity."

Augustine recognizes that time essentially implies transience, change, or succession. The problem of the nature of past, present, and future, however, troubles him. He finds his own arguments drive him to the admission that all time is past, present, or future, but that on examination the past does not exist, nor does the future, and that the present has no duration. Like McTaggart at a later date, one might expect him to conclude that time is an irrational contradictory thing, or alternatively and more correctly, to accept the principle of continuous change as the essential feature lying at the basis of time. He does neither of these things, but, having had the courage and insight to state the problem of metaphysics here involved, he seeks a solution by transferring the problem to another field, namely the domain of psychology. In effect this is shirking the problem of time as such and substituting an allied but different problem, that presented by *our awareness* of time. The psychological aspect, however, can never be a substitute for the metaphysical discussion. This Augustine fails to realize, and he contents himself with an examination (valuable in its way) which is psychological. He finds it easier to argue about memory and expectation than about the character of past and future because, like many writers of religious autobiography, he is a better psychologist than metaphysician and partly because he is able to disguise from himself what he has really done and the transfer of field he has made. He gathers up the past into memory and the future into expectation, makes both in a sense present without abandoning their significance as "forms" of the past and of the future.

II

The general temper of Augustine's mind, so characteristic of later mediaeval thought, is well seen by his treatment of the conception of a *City of God*, written, we must remember, when Rome had been sacked and the Vandals were besieging his own north African city. Augustine's solicitude for the social progress of the world is not dimmed by his belief that man can and should rise above the stress and strain of socio-political forces and conflicts. He shows us rather that balanced soul which grasps at once the reality of Time by events and Eternity by values. Not losing himself wholly in an abstract devotionism leading to other-worldliness and negligence of actual social problems in the time-order of history, Augustine was able to look upon that time-order as the medium for the realization of truths and values which transcend that time-order by their quality and their meaning.

It is precisely this realization which marked the work of Boethius and the writings of the great mediaevalists like Dante, Scotus, Albertus, Suarez, and Aquinas on the one hand, and mystics such as Eckhart, and later Boehme, on the other.

During the Dark Ages philosophy was in abeyance, but it is worth noticing that in the sixth century Boethius, the author of the *Consolations of Philosophy*, has some remarks to make on the subject of Time and Eternity. He regards Eternity as the completely simultaneous and perfect possession of interminable life (*interminabilis vitae tota simul et perfecta possessio*). "The now", says Boethius, "that flies away makes Time; the now that stands still makes Eternity". He also introduced the curious conception of *Aevum* as a mean between Time and Eternity, and this was later developed by the great doctor of the church, St. Thomas Aquinas.

The phrase *tota simul* is used by Aquinas to describe Eternity, and he was probably influenced by Boethius, whom he quotes, when opening his own discussion in the great *Summa Theologica*.¹ He there undertakes a discussion of the problem

¹ Aquinas, *Summa Theologica*, Part I. First number QQ. I-XXVI, pp. 96-109 (English Dominicans' edition). The enormous extent of the *Summa* may be gathered from the fact that there are over six hundred such questions dealt with in three thousand articles or sections containing arguments pro and con.

of Time as it arises in his tenth question about the Eternity of God. The discussion of this is divided into six articles, written in answer to the following questions: (1) What is Eternity? (2) Is God Eternal? (3) Is God alone Eternal? (4) How is Eternity different from Time? (5) What is the relation of *Aevum* (Age?) and Time? Finally, (6) Is there one *Aevum*, one Time, and one Eternity?

While in part accepting the general view expressed by Boethius, Aquinas subjects to criticism his definition of Eternity, and refuses his consent to a description of Eternity as *interminabilis vitae tota simul et perfecta possessio*. It is, he considers, an unnecessary tautology to refer to the whole as perfect, for it is the essence of the whole to be perfect; there is no need to attribute perfection to it when it is essentially perfect. Equally erroneous is it to describe the whole in terms of possession or of life. The whole is the totality of existence; it is being, not merely life. Eternity is the *tota simul*, an altogether, a timeless simultaneity. It has no beginning and no end; it is a perfect whole, and while it has parts, it wants nothing to complete it, being perfect and timeless.

Time, on the other hand, is no simultaneous whole, but succession. "Even supposing", he says, "Time to last for ever, we can still distinguish within it 'beginning and end' by noting various parts of it." Time for him is very much what it was for Aristotle: motion numbered by before-and-after (*secundum prius et posterius*) or measure of before-and-after. Aquinas realizes that it is in and through the succession of events that we come to know time, while it is also true that we use time to measure this succession. The implications and the paradox of this apparent dualism he does not, however, work out, although his extension of Aristotle's definition shows that he was aware of the duality. Like all the mediaevals, his interests lay in making clear his conception of the permanent One (common to Eleatic, Platonic, Neoplatonic and Christian thought) rather than in working out a detailed view of Time. He makes it clear, however, that while Eternity or permanence is a fundamental feature of reality, Time, which is succession, exists. He comes very near to repeating the phrase of Plotinus, that "to exist in time is to exist imperfectly". The "now" of Time is, Aquinas asserts, imperfect, and he considers Boethius must have used

the attribute perfect for the timeless whole in order to exclude expressly the "now" of Time. The *tota simul* is entirely different from and removed from Time.

Aquinas quotes Boethius' expression that "the now that flies away makes Time; the now that stands still makes Eternity." In Aquinas' view the Universe shows both Heraclitian and Parmenidean features. Time is, as Aristotle urged, bound up with motion, but the Eternal One exists immutable. In spite of his nearness to Aristotle in admitting time to be bound up with motion, Aquinas expressly says that time measures not only things actually changed, but also things changeable, hence it not only measures motion but it measures also repose or rest, which appertains to whatever is naturally movable but is not actually in motion.

One interesting conception in Aquinas' work is his doctrine of *Aevum*.¹ Time and Eternity are not, in his view, the only modes of existence. There is an intermediate form lying, as it were, midway between Time and Eternity, participating in each. While it is the characteristic of Time to exhibit the succession of before-and-after and while Eternity has not, nor can have, any before-or-after, the *Aevum* has not a before-or-after, but (he claims rather obscurely) they can be conjoined to it. "Spiritual creatures", says Aquinas (speaking in the phrases of his time), "as regards their affections and intellections, in which there exists succession, are measured by Time; as regards their natural being, they are measured by the *Aevum*; and as regards their vision of glory, they participate in Eternity."² *Aevum* differs both from Time and from Eternity as the mean between them both. He regards *Aevum* as "a more simple thing than Time, and as nearer to Eternity". He considers Eternity to have no beginning or end, Time to have both, while *Aevum* has a beginning but no end. Time refers only to what is material and corporeal, Eternity to God alone, while *Aevum* he ascribes to incorporeal and heavenly bodies.

Time is not eternal, nor is it correctly to be described as part of Eternity. Time and Eternity have nothing in common. Aquinas points out that some have founded this difference on

¹ Translated in the English Edition of the *Summa*, published by the English Dominican Order, by the term "Age". We prefer here, however, to retain Aquinas' original *Aevum*.

² Aquinas, *Summa Theologica*, Qu. X, art. 5.

the fact that Eternity has no beginning and no end, while Time has a beginning and an end. This, he objects, is merely an accidental and not an absolute distinction, because even supposing that Time always was and always will be, in accordance with the erroneous view of those who think that the motion of the heavens goes on for ever, there would nevertheless still remain a distinct difference between Eternity and Time, arising from the fact that Eternity is a *tota simul*, a whole existing all at once, while Time has not this character, but is essentially succession. Again, he argues, Eternity is the measure of a permanent being, while Time is the measure of motion. Aquinas returns to the Aristotelian phrase again, in spite of his criticism that time measures also repose of things which are movable or capable of change. He further says, in relation to the phrase of Aristotle, that time is not a number abstracted from the thing numbered, but existing in the thing numbered, otherwise it would not be continuous. "For example", he says, "ten ells of cloth are continuous, not by reason of the number, but by reason of the nature of the thing numbered."

The discussions on Time in the Middle Ages frequently tended, as in the work of Duns Scotus and Suarez, to unite time and motion to such an extent that not only was time regarded as intimately bound up with motion, but, further, time and motion were looked upon as materially identical and only formally distinct. The influence of Aristotle was responsible for this. William of Occam regarded time as the *mobile quod movetur*. Aristotle's remarks were, of course, venerated, but unanimity by no means prevailed.¹ Duns Scotus was bold enough to criticize Aristotle as an authority on this point. Already the antinomy to which Kant was to give such a prominent place in his first *Kritik* was being expressed. The Orthodox Scholastics held that Time had a beginning, although their arguments appear to have been based on revelation rather than on logic, while Averroes (Ibn Rosch the Commentator) and his followers, on the other hand, claimed that Time had no beginning. The Jewish philosophers had settled and independent opinions on Time. Gerson held that both time and motion were strictly finite and neither was eternal. For Maimonides time was relative to motion; apart from

¹ *Summa*, Qu. X, art. 5.

motion there could be no time. He regarded time as atomic in character and neither continuous nor infinitely divisible.

A distinction was made by the mediaeval thinkers, notably by the Spanish writer Suarez, between the physical time, measuring the motions of the heavens, and the spiritual, discrete time, made up of successive instants of change in the minds of the angels and measured by the consciousness of the supreme Angel.¹ The difficulty of presenting Time as real while looking upon it as consisting of a past, present, and future, of which the present is merely a line without breadth which divides the past from the future, was also discussed by them. Suarez anticipated the modern discussion of the specious present and of *la durée*, and tentatively suggested that succession might be experienced as a duration or that successive parts might be experienced in a whole which is changeless.² He also suggested that our experience of time is mental rather than spatial, psychological rather than mathematical, thus raising a point on which later Bergson was to lay great stress. While those points are interesting and suggestive of views of time developed in a much later period, we must beware of any tendency to read more into Suarez than is actually in his *Opera*. He did not formulate the Bergsonian view of time as mental, as a radically psychological fact, definitely non-spatial in character. A doctrine approaching more nearly to this, which asserted that time is essentially subjective, being bound up with soul or consciousness, put forward by Aureolus, was denounced as a philosophical and theological heresy by the University of Paris. The great doctor of the church, Albertus Magnus, who taught Aquinas, reports on the discussions which the schoolmen held on this interesting heresy. It was argued that time must be a mental construction, for, if time were generated by the motion of the celestial sphere, as commonly held, then all parts of time would co-exist. It was claimed, however (following an *ipse dixit* of Aristotle), that while number, and therefore time, could only be in the mind *in actu*, it existed objectively in the external world *secundum potentiam*. Albertus further reports Avicenna as objecting to the view of Aureolus on the ground that it makes time to consist of an aggregate of discrete moments.

¹ Suarez, *Opera* xxvi. 961.

² *Ibid.*, 985b.

These discussions show how old are our contemporary problems and how the mediaeval thinkers penetrated to the main points presented by the problem of the nature of Time.

The mystical writings of Eckhart in the fourteenth century contain some further references to Time in a style of writing which is reminiscent of Aquinas and foreshadows Spinoza. Eckhart seems to have possessed to a large degree the intellectual penetration coupled with the mystic fervour which we find in those two. The soul, he says, is created a thing between a first and a second. The first is Eternity, which ever holds itself within itself and is uniform; the second is Time, which changes and is manifold. With its highest powers, memory, understanding, will, (like unto the Father, Son, and Holy Ghost, the Soul touches Eternity) that is, God; with its lower powers, apprehension, temperament, desire, it touches Time, and thus the soul becomes changeable and inclined to bodily things and loses her nobility. "The little spark of reason is found only in God; in Him its birth occurs, and this not once in a year or in a month or in a day, but at all times, according to the Time above, in which there is neither Here nor Now. The *Now* in which God made the world is as near to the present time as is the *Now* within which I am speaking, and the Last Day is as near to that now as is our Yesterday." Meister Eckhart remarked in his quaint and mystical manner that "he who stands *continually* in a Present Now, in him God the Father begets his Son without ceasing."

For the mediaevals, history did not matter save the history of their own progress to the Divine Light and its contemplation. For them Time was irrelevant. This point of view is seen in many of the varieties of mediaeval religious experience, as in the work of Boehme, Eckhart, and Ruysbroeck.

One mediaeval legend relates in its naïve and picturesque manner how the good abbot of a certain monastery went out into the fields to commune with God. It was early morn and a lark rose on high, singing divinely the music of the Lord. The good old abbot remained entranced; the song led him into contemplation and adoration of God. Then he turned and wended his way back to his abbey. He was refused admittance. He mentioned his name, but they dismissed it with a smile. Yes, there had been an abbot of that name long

years before, but he was not the abbot now. The good man found the world three hundred years advanced, for while he listened to the lark and contemplated the glory of the Lord, time itself had been for him non-existent, blotted out of his experience.¹

The mediaevalists depreciated the time-process of history, for they were obsessed by the soul's attainment of contact with abiding reality. They were not preoccupied with the modern notion of Progress.² Even in the moderns a similar strain of thought is carried on and finds its climax in the *Ethics* of Spinoza, who, while he advanced considerably on the Cartesian philosophy, nevertheless appears to have taken over into his own work a number of ideas of both mediaeval Christian and Jewish philosophy.

For the mediaevals the temporal process was essentially teleological; it was the continuous transformation of potentiality into actuality, exhibiting a logical unity of sequence from the acorn to the oak, from the stone to the cathedral, from the human soul to the mystic eternal vision of God, Himself the Eternal, ever-present, unmoved mover of all things. The time flux was the flow of the future (potentiality) into the present (actuality). They did not look on time as passing from the past into the future, through an instantaneous present, which is merely the moving line of division between past and future, which are both (relatively to that present) non-existent. For the scholastic mind time, like space, was unimportant. Temporal relations were accidental, not essential, characteristics of reality. They sought logical connections, and temporal connections interested them little. They, indeed, discussed such problems as the passage of potentiality into actuality, but were indifferent to the historical process in time as such. Spinoza, as we shall see, inherited this mediaeval trait, and so, too, in some degree did Kant.³ The new science that was rising was, however, to raise both space and time from being accidental forms or minor entities to the rank of supreme or fundamental realities of the physical world.

¹ Cf. Longfellow's account of the monk Felix in *The Golden Legend*.

² On this see Wicksteed, "The Religion of Time and Eternity" (*Studies in Theology*); Bury, *The Idea of Progress*; Inge, *The Idea of Progress*.

³ The view of Time as a form would have been congenial to the scholastic mind, but, in the work of Galileo and Newton, Time had a new character.

CHAPTER III

NEWTON AND THE EARLY MODERNS

Descartes negligent of Time. His insistence on relativity of movement. Spinoza likewise failed to appreciate Time. Views of those thinkers deductive and geometrical rather than historical. Logical concepts cannot give us temporal reality. Spinoza's use of terms "Duration" and "Eternity". The new science and Galileo. Space, Time and Motion given a new importance. Barrow's contributions. Quantitative view of Time. Newton's views. His doctrine of Absolute Time. Locke and the psychological view. Physical *v.* Mental Time. Objective and subjective views contrasted. Criticism of Newton by Berkeley and Leibnitz. Letters of Clarke and Leibnitz. Nature of the controversy. Reid's criticism of Locke. Reid's views on Duration. Hume's opinions sceptical.

I

WITH the rise of Modern Philosophy the psychological, subjectivist, and idealist view of time was advocated. Descartes looked upon time as arising from motion, and on our temporal experience as due to a comparison of the durations of certain regular motions, and as a manner of conceiving of duration in general.¹ He realized the philosophical implications of the Copernican discovery and raised the problem of the relativity of movement. This part of Descartes' work was subsequently neglected, to the detriment of both science and philosophy. His arguments for motion and rest as mutually dependent on systems of reference, the view of translation as relative to the members and parts of the system, and the grasp of the fact that no zero, void, or stable point exists by which absolute movement may be calculated, were valuable anticipations of some fundamental points involved in the theory of Relativity.

Rest and immobility are, and in the nature of things can only be, relative. There are no fixed, stable points in the universe. We speak of ourselves as "motionless, still, or at rest" when we keep the members of "our system of reference" in their relative positions with regard to us. We "rest" on a train, or ship, or aeroplane. We are "at rest" on the earth, which is moving round the sun. Motion is relative, and movement is not absolute change of place, but relative change of locality or neighbourhood. We can only define it relatively when one

¹ Descartes, *Principia*, I. 57.

object is moved or moves away from another; either object may be regarded as in motion relatively to the other. This is practically Einstein's attitude to motion.

Science felt itself unable, however, to extend the principle of relativity of movement to accelerated movement. It was led, therefore, to sacrifice the whole conception for one more immediately useful, the Newtonian. Force, gravitation, absolute space and absolute time were set up. "C'est ainsi", says Bergson, "que le dynamisme newtonien parut couper court au développement du mécanisme cartésien."¹ The sacrifice of the Cartesian principles of relativity of movement was a real loss to science. She accepted the more immediately useful Newtonian hypothesis simply because the introduction of gravitational forces appeared to offer a new absolute, and the view of Descartes was rejected.

In spite of his interest in motion and its problems, Descartes appears to have been singularly negligent of time as a factor. He was so obsessed by extension that time for him had little significance. This is clear from the wording of his fifty-seventh Principle, in which he draws a distinction between time and duration. He suggests in the French version that time is merely a mode of thinking duration, and had he not been so contemptuous of time, he might have given some interesting discussion of the relation of the concept of time to the percept of time.

"Some of the attributes are in things themselves and others are only in our thought. Thus time, for example, which we distinguish from duration taken in its general sense and which we describe as the measure of movement, is only a mode of thinking;² for we do not, indeed, apprehend that the duration of things which are moved is different from that of the things which are not moved, as is evident from the fact that if two bodies are moved for the space of an hour—the one quickly, the other slowly—we do not count the time longer in one case than in the other, although there is much more movement in one of the two bodies than in the other. But in order to comprehend the duration of all things under the same measure we usually

¹ In his latest book, *Durée et Simultanéité à propos de la Théorie d'Einstein* (1922), p. 41.

² "Is only a mode of thinking that duration" (French version).

compare their duration with the duration of the greatest and most regular motions, which are those that create years and days, and these we term time. Hence this adds nothing to the notion of duration, generally taken, but a mode of thinking."

Descartes was unable to develop any clear metaphysic of time, because having erected two worlds, *res extensa* and *res cogitans*, he had to admit that in some sense at least time belonged to both of them, but he failed to appreciate the difference involved in mental time and physical time, partly because he did not realize how the physical problem could be treated separately along the mathematical line indicated by Galileo.

Similarly for Spinoza, Time played no part in his system. In his *Cogitata Metaphysica*, appended to his *Exposition of Descartes*, Spinoza dismisses it as devoid of ontological significance. Alexander has shown how negligent Spinoza has been of Time and how its recognition would have entirely transformed his system.¹ Rejecting the view of the Mediaevalists, Spinoza predicates duration of finite existence, whereas the Schoolmen had confined it to God and the angels.

In the Cartesian metaphysics motion is a mode or state of matter imparted to it by God. Empty space was nothing and matter was conceived as existing in three dimensions. Spinoza looked on matter not as a substance but as an attribute of substance, and he conceived of motion and rest as universals or infinite modes. Descartes began with his *res extensa* and was unable to get motion introduced save by the hand of God, thus making the Deity serve again as a mere *Deus ex machina* in the Cartesian drama. Spinoza made a great advance in science and metaphysics by denying that motion was "put into" immobile matter externally by a creative act of God, and affirming in place of this the doctrine that matter is motion and rest. Here again he purged from philosophical speculation the unnecessary theological impositions of the Schoolmen, from which even Descartes, revolutionary as he was, had been unable or unwilling to rid himself.

The age was an age of geometrical methods, and the view of motion taken by thinkers of that century was from the

¹ In his *Spinoza and Time*. Wolf, *Spinoza, the Last of the Mediaevals*, and in *Chronicon Spinozanum*, II.

standpoint of geometry rather than that of physics, that is to say, they conceived of motion rather too simply as change of place. For them the spatial element was paramount. Change, however, implies time, and of this factor Spinoza has very little to say. His material world is summed up in three dimensions. Alexander has shrewdly suggested that Spinoza should have included time as a fourth dimension and as an attribute of the deity.¹ The importance of the idea of Time in metaphysics is, however, a relatively recent development in philosophical thought. In the history of the development of philosophy Spinoza must be ranked with those who assert, with Plato, the permanent character of the universe. He begins with the Infinite and Eternal and not with the things which are temporal and finite, and he returns to look on all things from the standpoint of Eternity. The Eternity under which we conceive the existence, activity and infinity of God is not quantitative.²

Spinoza looks upon time as merely a mode of thinking things. Duration is the attribute under which we conceive the existence of created things. Duration, therefore, is definitely related to existence, but not to the ultimate nature or essence of reality. There is, however, as Mr. Joachim points out at the end of his *Study of the Ethics of Spinoza*, some inconsistency involved in Spinoza's employment of the term Duration. We see this when we investigate carefully some of his pages on the relation of Eternity and the Mind.

Eternity, as Spinoza uses the term, is not mere indefinite length of time. As we have said, duration cannot be a feature of the Eternal, as the Schoolmen maintained. Elsewhere Spinoza speaks of Time as a cutting up of duration, or as a picture or image of persistent duration. In one place he uses "duration" in place of "eternity". In another he explicitly excludes time (*and duration*) from the Eternal. Eternity is not infinite duration, nor can it be expressed in terms of duration, for duration is merely existence and not essence or ultimate reality. If God had duration He would be creating Himself and becoming more real as time goes on. We cannot even say with

¹ Alexander in his published lecture on *Spinoza and Time*. For a discussion of the difficulties bound up with Descartes's view of motion see Kemp Smith's *Studies in Cartesian Philosophy*. See also Alexander, *Space, Time, and Deity*, Vol. I, p. 44; Vol. II, p. 401., reference to which is made in our Chap. VI.

² *Ethics*, II. 45.

correctness that He has existed "from all eternity", for this is to confound eternity with what is merely indefinite duration. Eternity is not a long time; it involves timeless necessity of being. This is the sense in which Spinoza employs the term Eternal Life. He has no intention of postulating an immortal or future life for the individual person. The human mind is eternal in so far as it becomes (through adequate ideas and through the intellectual love of God) a mind which can glorify God and enjoy Him. The attainment of this eternal life is "the chief end of man".

Time is in Spinoza's philosophy conspicuous by its absence. He even seems to forget that motion implies time, and he is more preoccupied with logic and thought than with evolution and time. The laws of science are in his view eternal, but the correct attitude to such laws is to say rather that they are true at any time than that they are wholly independent of time.

Spinoza has been styled, not without some reason, "the last of the mediaevals". In spite of his keen interest in the new science and his conceptions of law and causality, which have endeared his philosophy to men of science, it must be remembered that his conception of causality is logical rather than temporal in character—indeed, he attempts to reduce reality to a system of logical concepts.¹ There is for him, as for Parmenides, no real temporal evolution from substance to modes. All is given in the nature of substance and follows logically, not temporally, therefrom. He ignores the undeniable element of time in nature, in history, and in our own experience.

II

The rise of the new scientific discoveries of Copernicus, Kepler, and Galileo marked a new epoch, and the last thinker gave to motion and to time a more precise character than had been allotted by previous thinkers. Rejecting the teleological terminology of the scholastics, who had mainly been concerned with the passage of potentiality into actuality, with the *why*

¹ For a recent discussion of Spinoza's treatment of Time cf. Hallett, "Spinoza's Conception of Eternity" (*Mind*, July 1928, pp. 283-303). I cannot agree, however, with Mr. Hallett's view of objective time (p. 291).

of motion, Galileo undertook to describe more exactly *how* motion takes place and to give an exact measurable, mathematical character to time. Galileo was not concerned about conceptions of final causes, but with the concrete processes of motion. He created an empirical and mathematical science in place of the idealistic physics of the mediaevals.

All motion, according to Galileo, involves certain units of space or distance covered in certain units of time. This naturally brought space and time into prominence and gave them recognition from a new point of view. For Galileo the world was a world of bodies in motion which could be expressed mathematically in terms of space and time. This motion took place in space and time; these became fundamental categories and were regarded as absolute mathematical *continua* and ultimate metaphysical concepts. Time was still "the measure of motion".

In place of the moving of potentiality into actuality, the future into the present, Galileo substituted a view of time as a *continuum* fashioned by the moving present, moving from the past into the future. He established the notion of objective mathematical time, the pure '*t*' of physics with which we are to-day so familiar. This conception was arrived at by a rigorous objectivity in which time as experienced or lived by the subject was altogether excluded. A scientific concept was set up in which the present was merely a moving line and no account was taken of our perceptual experience, which is not instantaneous but durational. For Galileo, however, time was a fourth dimension, irreversible in character and capable of representation as a straight line, and this geometrical and mathematical formulation was adequate for his purposes, which were strictly those of a physicist. This is his chief title to notice in connection with our problem, and while he still held, as did the ancients, that time was bound up with motion, he enunciated for the first time the importance of the quantitative mathematical treatment of time. He was not at all concerned with the problem of the relation of time to consciousness. His outlook was purely objective, and as he never raised the question of subjective or mental time, he made no attempt to relate our perceptual experience of time to his objective and mathematical concept of time. Still less was he concerned with relating his mechanical

world to the teleological and logical world of the mediaeval thinkers. From being regarded as a world of substances and essences in qualitative and teleological relations, the world now came to be described as a realm of bodies moving in a mechanical fashion in space and time, and in terms of forces, motion, acceleration, momentum, and velocity. Thus time came to be given an importance which the mediaevals (and Descartes and Spinoza) never bestowed on it. Time was no longer merely the measure of motion, but rather something independent of motion (but measured by motion), and flowing on its course for ever and ever as enduring as God Himself—an objective reality independent of our perception of it.

The most rigorous thinker who strove to set up the new view of the world, of matter and motion, was, from one point of view, Hobbes. Like Spinoza, he had great interest in human affairs, in social psychology and politics, but he was unable to interpret the facts of psychology and politics in the same terminology and the same nominalist and materialist view adopted in physics. This was largely because he failed to see that mind had to be explained by purpose as well as by origin. Hobbes rejected teleology or final causes and acknowledged only efficient causes. His psychology suffered in consequence and had marked influence on Locke and Condillac. The life of the mind was largely an affair of phantasms, or decaying sense images. Time itself was such a phantasm, for in his view motion, but not time, was an objective reality. Time is a decaying image in the mind due to the objective before-and-after relation of motion. Past, present, and future are merely subjective and arise from memory and anticipation. "The present only (he writes in *Leviathan*) has a being in nature; things past have a being in the memory only, but things to come have no being at all, the future being but a fiction of the mind applying the sequels of actions past to the actions that are present".¹

In his treatise *De Corpore* Hobbes defines time as "phantasma motus quatenus in motu imaginum prius et posterius sive successionem", and treats it in a purely subjective manner as arising in our minds in relation to our perception of motion

¹ Hobbes, *Leviathan*, Bk. I, 3. Compare Broad's view of the non-entity of the future.

or change.¹ This treatment Locke was to challenge by asserting that time does not depend primarily on the perception of motion, but on our introspection and observation of the succession of ideas in the mind. Locke, although he had some difficulty in showing how the succession of ideas gives rise to the idea of succession, saw *both the objectivity and the subjectivity of time*, and his discussion, while unconvincing in several ways, is most valuable for the way in which he brings out this distinction. We must not here anticipate our account and criticism of Locke's work, the full significance of which can only be seen in relation to the development of the problem in the work of Barrow and the doctrine of Absolute Time propounded by his great pupil, Newton, together with the criticisms thereon by Berkeley, Leibnitz, and Hume.

III

The seventeenth century was marked by great advances in physics and astronomy. Galileo himself did not die until 1642 (twelve years after Kepler, eight years before Descartes), in which year Newton was born. In this century not only on the experimental side were there considerable discoveries, but notable achievements were made in the realm of quantitative measurement and in developing the concepts and methods of mathematical physics. Keen discussions upon the new scientific and metaphysical concepts took place at Cambridge, arising in the first place out of the discussions between Henry More (the Cambridge Platonist) and Descartes. More disliked the dualism inherent in the Cartesian thought, but rejected the materialistic and dogmatic attitude of Hobbes. Cudworth carried on the spirit of More's work, but it is in Barrow, who was the predecessor and teacher of Newton, that the problem of Time comes to be specially treated in a manner which is of considerable metaphysical significance.

Barrow delivered lectures on mathematical physics in 1664-6, and was the first writer to make it clear that science, in so far as it concerns itself with time, is primarily interested in *quantity*, in measurement.² The perfect and certain science he asserted to

¹ Hobbes, *De Corpore*, VII. 3.

² The *Mathematical Works* of Barrow were re-issued in Cambridge in 1860.

be the one of which he (and later his great pupil) was Professor, namely mathematics. Now, "mathematics is a science of measurement". This is a point to be remembered in view of the later Relativity discussion of time, and also in view of Plotinus' assertion that *measurement* of time leaves unsolved the problem of the *nature* of time.

The views held by Barrow in regard to Time are of interest and importance and are to be found in his *Lectures on Geometry*. For him, as a mathematical physicist, time has certain indubitably quantitative features. He is at pains to make it clear that he does not consider time to be identical with motion, nor does he think that time implies motion. "Not at all, no more than rest; the quantity of time depends on neither essentially. Whether things run or stand still, whether we sleep or wake, time flows on in its even tenor."

In order to bring out this point—that the flow of time is independent of both motion and rest—he says: "Imagine all the stars to have remained fixed from their birth; nothing would have been lost to time—as long would that stillness have endured as has continued the flow of this motion. Before, after, at the same time, even in that tranquil state, would have had their proper existence. . . . But although those magnitudes are quantities absolutely independent of all reference to measure, yet, says Barrow, we cannot perceive their quantities except by the application of measures. Thus time is in itself a quantity, although that the quantity of time may be distinguished by us the aid of motion must be called in as a measure by which we judge temporal quantities and compare them with each other; and so time as something measurable implies motion, since if all things had remained unmoved, in no way would we be able to distinguish how much time had flowed past."

Barrow, in spite of his lengthy sentences, has a delightful manner of discussion and shows keen penetration into the problem of Time, even although his viewpoint is mainly that of one concerned primarily with quantity and measurement. "It is not", he writes, "apparent to those roused from sleep how much time has intervened; but from this it is not rightly deduced that 'it is clear that, apart from motion and change, there is no time'. We do not perceive it clearly, hence it does not exist—a piece of deceptive inference—and sleep is deceptive

which causes us to connect two distinct instants of time. Moreover, since we conceive time as flowing past always in an even channel, not now more slowly, then more rapidly in turn (if, indeed, such disparity be granted, time would in no wise admit of computing or dimension), on that account not all motion is judged equally suited for determining and distinguishing the quantity of time, but chiefly that which, being in the highest degree simple and uniform, proceeds always in an even tenor." In order to determine time, or more exactly to measure it, we must choose, therefore, according to Barrow, some mobile which, "as so far as concerns the periods of its motion, keeps constantly an equal impulse and covers an equal distance." Generally, of course, man has found this in the motions of sun, moon, and stars.

Barrow then shrewdly passes from his earlier discussion of time and motion to a further point. He claimed that time was not motion, but was only measurable by motion. If, then, we may ask, the measurement of time depends on motion, how can time itself be the measure of motion? This is a crucial point to which Plotinus had drawn attention and which assumes great importance in the more recent discussions which lead up to Relativity.

As we remarked in dealing with the Neoplatonist, how can we consistently affirm that time is a measure of movement and that it is itself measured by movement? We can only know equal times by some constant velocity or rotation, but we can only know that any rotation is constant if we already know and can measure equal times.

Although the motions of the celestial bodies have generally served as a measure for time, Barrow points out the difficulty in which we are involved in this connection. How can we know that these revolutions take place in equal times? Only, he claims, by comparing the motion of, e.g., the sun with other equal motions observed near us by the senses and subject to our experiments.¹ He declares emphatically that so far from accepting the celestial motions as fundamental measurers of time, we really time their motions, so that actually these motions are not the basic measures of time. Not even is Sol

¹ Compare Augustine's remark about the battle in which the sun "stood still". *Confessions*, Bk. XI.

himself a worthy judge of time, or to be accepted as a veracious witness, except so far as time-measuring instruments attest his veracity by their votes!

This statement has obvious echoes in the difficulties of Poincaré and others at a later date, where the relativity position becomes clear in the supposition that while looking for a constant time-measurer, we cannot suppose a velocity or rotation to be constant unless we suppose also that we know how to measure time, for we need to know "the time" in two places, or, in the case of a rotation, we must be sure of equal times.

Elaborating the discussion of the relation of time and motion, Barrow proceeds in his attractive manner: "Nor let anyone object that time is commonly regarded as the measure of motion, and that consequently differences of motion (swifter, slower, accelerated, retarded) are defined by assuming time as known; and that therefore the quantity of time is not determined by motion but the quantity of motion by time: for nothing prevents time and motion from rendering each other mutual aid in this respect. Clearly, just as we measure space, first by some magnitude, and learn how much it is, later judging other congruent magnitudes by space, so we first reckon time from some motion and afterwards judge other motions by it; which is plainly nothing else than to compare some motions with others by the mediation of time, just as by the mediation of space we investigate the relations of magnitude with each other. . . . Further, since time, as has been shown, is a quantity uniformly extended, all of whose parts correspond to the respective parts of an equable motion, or proportionately to the parts of space traversed by an equable motion, it can be represented—that is, proposed to our mind or fantasy—in a most successful manner by any homogeneous magnitude, especially by the simplest, such as a straight or circular line, between which and time there are also not a few similarities and analogies."

"But how, say you, do we know that the sun is carried by an equal motion, and that one day, for example, or one year, is exactly equal to another, or of equal duration? I reply that in no other way is this known to us (excepting what may be gathered from the divine testimony) than by comparing the

motion of the sun itself with other equal motions. Certainly if the motion of the sun as registered in the sundial . . . be perceived to agree with the motions of any time-measuring instrument which is constructed with sufficient accuracy.¹ . . . From which reasoning it seems to follow, which perchance may appear astonishing to some, that, strictly speaking, the celestial bodies are not actually the first and original measures of time, but rather those motions which are observed near us by the senses and are subject to our experiments, since by their aid we judge the regularity of the celestial motions."

The balance of the passage elucidates this point somewhat further: "For besides the fact that time has parts which are wholly similar, it accords with reason to consider it as a quantity endowed with a single dimension; for we conceive it constituted either by the simple addition of successive moments, or by the (so to speak) continued flow of a single moment, whence we are accustomed to attribute to it length alone; nor do we determine its quantity in any other way than by the length of a traversed line. Just as I say a line is regarded as the path of a moving point, possessing from the point a certain indivisibility, but from the motion divisibility of one kind, that is according to length—so time is conceived as the path of an instant continually flowing, possessing a certain indivisibility from the instant, but divisible in so far as it is successive flow. And just as the quantity of a line depends on length alone, the result of motion, so the quantity of time follows from a single succession spread out, as it were, in length, which the length of the traversed space proves and determines. So we shall always represent time by a straight line. . . ."

Time he describes finally as not being an actual existence or independent metaphysical entity. It does not denote an actual existence, but simply a capacity or possibility of permanent existence. It is here that we see the dual aspects inherent in Barrow's thought, striking as this is in its scientific attitude to time as quantitative, for Barrow's thought was not independent of his theology. Just as he was a professor of mathematics and a doctor of divinity, so he is interested in the scientific examination of time and in its theological implications,

¹ (The sentence is incomplete in the original.) Quoted by Burt, *The Metaphysical Foundations of Modern Science*, p 151.

even as More was impressed with the theological interpretation of space as God's Presence—a point reiterated by Newton. Time, for Barrow, is related to, and in a sense part of, the manifestation of an enduring divine nature. He is a Platonist in that, for him, Time is regarded as a moving image of Eternity. This point of view never entirely leaves him, and is the main reason why he did not adopt whole-heartedly the conclusions to which his scientific treatment tended, namely the assertion that time is relative to motion. In addition it must be remembered that he had formulated a definite view of time as a mathematical quantity—indeed, Barrow was the first thinker to discuss time at all fully and to carry that discussion a stage further than the mere reiteration that it was the measure of motion. He asserts it is not motion, but is only measurable by motion. In his notice of the paradox involved in our attempts at time-measurement, and especially in his clear enunciation of the purely quantitative interest of the mathematical physicist, he occupies a position of unique importance in the development of our ideas about Time. He prepared the way not only for his pupil, Newton, but for that very criticism of Newton which came later in the new physics leading up to the doctrines of Relativity.

IV

Newton's *Principia* was published in the years 1686 and 1687. The attitude taken up by Newton with regard to our problem is not only interesting but highly important, as it set the tone of orthodox physics and in many directions tended to dominate both scientific and philosophical thought for the next two centuries. Real Time he conceived as an Absolute, an independent, homogeneous medium. Newton distinguished this Time—Absolute Time, which he called duration—from the relative "popular" time, which is a merely sensible and external measure, like hour or month. He defined absolute, true mathematical Time as something "which in itself and from its own nature flows equally without relation to anything external." Such Absolute Time is a constant. "Tempus absolutum, verum et mathematicum in se et natura sua sine relatione ad externum quodvis, aequabiliter fluit alioque nomine dicitur duratio:

Relativum apparens et vulgare est sensibilis et externa quaevis durationes per motum mensura (seu accurate seu inaequabilis) qua vulgus vice veri tempore utitur ut hora, dies, mensis, annus."¹ ("Absolute Time—true mathematical time unrelated to anything external—flows uniformly and is called duration. Relative, apparent or common time is that sensible and external measure of any equal or unequal portion of duration in a state of motion, such as the measures of hours, days, months, etc.")

Then, as if in momentary doubt of the truth of Descartes's relativity-view, he wrote: "It is quite possible that there is no perfectly equable movement which can serve as an exact measure of time, for all movement may be accelerated or retarded. . . ." It was this point which, at a much later date, Poincaré stressed in such a manner as to bring out the essential relativity of time and motion. Newton, however, went no further along this line, contenting himself with his conception of Absolute Time, which must always flow at the same rate.

Previously the relation of the nature of time to mechanics and astronomy had not been clearly noticed. It was only in Newton's day that the ideas of force and time came to be definitely associated in mechanics and that in the field of astronomy, geometry and time were found to be associated. Had he been more fully aware of the importance of time in physics he would not himself have defined a law of motion as simply "change of motion is proportional to the impressed force", but would have more logically and truly said: "The rate of change of motion is proportional to the impressed force, where the rate of change can be computed in accordance with a time-series."

Later on he refers further to his doctrine of Time. "Absolute Time, in astronomy", he says, "is distinguished from relative by the equation or correction of the vulgar time. For the natural days are truly unequal, though they are commonly considered as equal, and used for a measure of time. Astronomers correct this inequality for their more accurate deducing of the celestial motions. It may be that there is no such thing as an equable motion, whereby time may be accurately measured. All motions may be accelerated and retarded, but the true or equable progress of Absolute Time is liable to no change.

¹ Newton, *Principia*, I. Def. VIII. *Scholium I*.

The duration or perseverance of the existence of things remains the same (whether the motions are swift or slow or none at all), and therefore it ought to be distinguished from what are only sensible measures thereof; and out of which we collect it by means of the astronomical equation. The necessity of which equation, for determining the times of a phenomenon, is evinced as well from the experiments of the pendulum clock as by eclipses of the satellites of Jupiter."

It must be admitted that such a Time can be *conceived*. But whether it is real is quite another matter which experience must decide. Mach, in the criticisms which began the anti-Newtonian views, pointed out that the fact that we can represent such a Time to ourselves in no way implies that we can recognize any such Time in the Universe. In other words, Absolute Time may well prove to be a concept to which no percept corresponds. It may be a fictitious conception, and this the modern Relativity development claims (as we shall see in our fifth chapter). In any case, Newtonian Absolute Time presents initial difficulties if it be true, as Newton himself admitted that "possibly there is no equable movement that can serve as an exact measure of time". The Absolute Time, therefore, cannot be known or measured, and so far as human perception is concerned must remain unknowable. The Deity alone could know such time. For us time is known by events, and time so known is not Newton's Absolute Time. We must remember, however, that Newton's Absolute Time, like that of the Relativists, was based, not on a specific inquiry into the nature of Time as such, but upon physical and mathematical requirements, dictated by the science of the day. In addition, his natural philosophy was not entirely divorced from his theological conceptions, being indeed coloured by them.

Newton's doctrine involves an initial distinction of great importance. He claims that time, as grasped immediately in sensuous perception, is different from Time as grasped after the fashion of a mathematical concept. It is the conceptual Absolute uniformly flowing Time which is the real, while the relative time offered by outer and inner observation denotes only sensuous and, therefore, an inexact and unreliable measure for empirical movement. Physics seeks to advance from percept to concept; only thus can it reach objective reality.

Description of this reality must be, not in terms of the experience of the sentient observer from his purely relative and subjective standpoint, but in terms of universal form and objectivity—that is to say, in conceptual terms.¹

Ordinarily, time is regarded, Newton notices, as entirely relative to events. This popular notion is inadequate and unsound. Time is a homogeneous entity entirely independent of events or motion, and in this medium or continuum events and motions happen. There is an Absolute Time moving with equable velocity, and he suggests that we approximate to a knowledge of this by correcting popular notions of time by reference to motions of the celestial bodies. It thus appears that reference to motion or events is necessary, and he realizes that maybe there is no equable motion by which we can measure Absolute Time. None the less such Time exists, in his opinion, independently of whether such or any motion exists at all.

The critical query naturally follows: How, then, do we know that such an entity as this supposed Absolute Time exists? Further, why did the empirical Newton suggest such a doctrine, so obviously an hypothesis which it seems impossible to verify? Newton's defence is that we do know there is such a thing as Absolute Motion, and this in itself implies that there exist both Absolute Space and Absolute Time. His argument, however, is circular, as it really only shows that we must assume Absolute Space in order to believe at all in Absolute Motion, which is a *petitio principii*. To meet this, Newton, finding himself in difficulty, invokes the notion of Force. Where there is force, he says, there we have Absolute Motion. This conception, however, is animistic and rests on a crude psychology then current. Modern Science since Newton has not found the conception of force useful. It raises more difficulties than it solves.² It may be argued that motions produce what we call forces. Even the so-called force of gravitation resolves itself in the new physics into the effect of certain motions.

Yet it is a fact that we observe and measure motion. It may

¹ The concept must be valid, not imaginary. See the interesting and important discussion on this point by Cassirer, given in Chap. V.

² Mach, *Science of Mechanics*.

be argued that if two bodies touching each other become separate there is motion involved, which is absolute in some sense. This involves time, and if we admit as much, Newton would urge that we have admitted Absolute Space and Absolute Time. But these he had defined as homogeneous entities, hence it is impossible to observe any motion simply in Absolute Space or Absolute Time; it is only possible to observe motion in such space and time with reference to and in relation to other bodies. Absolute Space and Absolute Time by themselves do not help us; we can find in them no differential points, and to measure motion some system or point of reference is essential.

Newton did not see this truth, which was later to prove the basis of Mach's criticisms and those of Poincaré and Einstein. As a matter of fact, Newton's Absolute Space and Absolute Time were conceptions of a theological kind inherited the one from More, the other from Barrow. The reason for his assertion of these entities lay in his belief in Deity, and this he clearly states in a later edition of his work. "God", he declares, "by existing always and everywhere, constitutes Duration and Space."¹ They are, in the physical world, the signs of His omnipresence. In Him they live and move and have their being. We know that space for Newton was the "divine sensorium". Thus Absolute Space and Absolute Time are necessary to him for theological reasons, as they constitute the two *continua* of the divine knowledge and control, which are omnipresent and everlasting. If the baffled physicist, devoid of stable point of reference, cannot tell whether a given motion is relative or absolute, he can at least reply: "God knows".² The contemporary physicist would make this reply in a tone of contempt and scepticism, but Newton makes it seriously and reverently, as for him the divine consciousness, everywhere present, is the sole criterion of absolute motion. God is a being akin to Aristotle's Prime Mover, an almighty will originating motion itself, and all motion is divine energy or the resultant of such energy, thought, or will.

Newton's theological convictions, however, were unable to save Absolute Motion, Space, or Time, for even his introduction

¹ Newton, *Principia*, 1713 Ed., p. 311. *General Scholium*,

² *Ibid.*, *Optiks* (Queries).

of God left the problem still open to the critic to ask: If God were present with every motion, would not motion be unreal to Him? And if He were not so present, then every motion would be for Him absolute. But such a criticism was not raised at that time. Critics indeed appeared who attacked Absolute Space and Absolute Time for the opposite reason: that they seemed to leave no room for God at all.

Rejecting theological implications for the present, we may note that the final Newtonian position about Time is not satisfactory. He conceives Absolute Time as flowing equably without regard to anything external. Such a view dispenses with the real basis of time, the concrete flow of events. It is rather that present happenings, events, come into being and flow from future to past, or, in mediaeval phrase, from potentiality or future to actuality in the present, and then out of existence into the past.¹

The truth is that Newton failed to distinguish between the concept and the percept of time. Other distinctions which were involved in the contrast of mediaeval thought and the new science he failed to clarify. Time may be thought of as succession of events in the relation before-and-after which, in relation to us and to their happening, appear to be future, present, and past. The present alone is real; the future does not yet exist; the past is gone. This present moves, and as it is based on the continuous instantaneous change of the universe, it may be spoken of as flowing equably, as Newton said. But it is only part of the concept of Time, for this we intend to cover indefinite Time, both past and future. We never perceive the whole of Time, but we conceive of Time in a manner that often has little relation to perceptual experience. It is true that perception does not give us an adequate view of reality, but there is a grave danger that our conception, unless critically examined and controlled by reference to experience and to other considerations of thought, may carry us to an imaginary and illusory conception of Time. This will become clearer when we pass to Newton's critics, and particularly to Locke, who brought prominently into contrast, not only the perceptual and the conceptual Time, but also the contrast, which arises from

¹ The question whether we should include the past within "existence" is discussed in our last chapter, on "The Nature of Time".

the work of Galileo and Barrow, of mental or subjective *v.* physical or objective Time. This distinction was not really raised by Newton, who, from physics, turned under the influence of More and Barrow to theology, but not, unfortunately, to psychology.

V

Newton's concept of Absolute Time drew upon it the criticisms of Locke and Berkeley. The treatment of the problem by both of these writers is highly important.

Locke points out in his treatment of Time that whereas in dealing with spatial lengths we are dealing with "lasting distance, all of whose parts exist together", with temporal lengths, we are concerned with "perishing distance, of which no two parts exist together but follow each other in succession".¹ This particular kind of "perishing" length, or the idea of succession in duration, is for him the simple "idea" from which all our conceptions of times, and of Time itself, are built up. The idea of duration as well as that of succession arises from our perceptual experience, being founded, according to him, on our awareness or "notice" of the passage of a train of ideas through our mind. The constancy of this succession of ideas is an essential feature of our waking life.

Yet, he argues, such ideas could never arise if all were in flux. The notion of succession itself can only arise in the relation of contrast to a permanent, which is, for him, our enduring awareness of the self. The notion of duration arises out of the contrast of successive perceptions against a background of the awareness of the continued and united existence of the unchanging permanent self for whom these successive perceptions are, and "whose" they are in a possessive and personal sense.²

¹ Locke, *Essay on the Human Understanding*, Bk. II. 15, 12.

² "For whilst we are thinking, or whilst we receive successively several ideas in our minds, we know that we do exist, and so we call the existence or the continuation of the existence of ourselves, or anything else commensurate to the succession of any ideas in our minds, the duration of ourselves, or any such other thing co-existent with our own thinking." *Essay*, Bk. II. 14, 3. On this fact (also stressed by Fechner) J. W. Dunne erects his elaborate but unconvincing arguments for time-dimensions *ad infinitum* (serial time). Cf. *An Experiment with Time*.

Locke proceeds to make an "odd conjecture" that "there seem to be certain bounds to the quickness and slowness of the succession of those ideas one to another in our minds, beyond which they can neither delay nor hasten". An instant he defines as a portion of duration which takes up "the time of only one idea in our minds without the succession of another".¹ Obviously this is rather what is generally meant by "moment", and is connected with the idea of the specious present. Such a moment or instant does not contain, Locke thinks, any sense of succession. If this be so, we would confine its use to only a portion of the specious present.

The trend of Locke's discussion is to give, on the whole, a distinctly subjective colour to time. Our notions of duration and succession have a subjective origin. They arise for him from the flow of "ideas" in our minds rather than from the perception of an objective world of events or happenings. Our consciousness of time is not (Locke claims in opposition to Hobbes) dependent upon the apprehension of movement or change external to us in space. Motion, he argues, can only give rise to an idea of duration if, and in so far as, it occasions a constant succession of ideas. Conversely, such a succession of ideas can occur in our minds independently of the perception of any motion.² Time is thus, for him, constituted by an *inner sense* of duration and sequence, not by a perception of an enduring world of change, given *objectively*.

Locke, it might thus appear, could be presented as a strong apostle of subjective, psychological time in opposition to Galileo, who refused altogether to consider time from the human end. We have thus arrived at a period in which the two notions of time (as physical and objective on the one hand, and as psychological and subjective on the other) are being put forward separately. But although Galileo felt he could dispense with subjective time, Locke cannot so easily dispense with objective time, and he is shrewd enough to see this. He is led to this admission largely by recognition of the fact that our subjective estimate of time, based on our own private awareness of duration and of the sequence of our own ideas, is likely to be misleading and fallacious, both in regard to length and order of sequence. Our awareness of time varies,

¹ *Essay*, Bk. II. 14, 10.

² *Essay*, Bk. II. 14.

he notices, with our attention. "One who fixes his thoughts very intently on one thing, so as to take but little notice of the succession of ideas that pass in his mind, whilst he is taken up with that earnest contemplation, lets slip out of his account a good part of that duration and thinks that time shorter than it is."¹ Owing to the incorrectness of subjective personal calculations, we are forced, in order to measure time, to find some objective standard of reference by which we may correct our own unreliable notions. This we find in the movements of the heavenly bodies which offer us an external, objective, system of reference and *appear* to give us units of duration which are *approximately* uniform. This external reference system gives us measured duration, and this, for Locke, is time.

It looks as if Locke had forgotten altogether his earlier subjective theories about time. He practically defines time as two different things in two different places. In one it is the *inner sense* of sequence of ideas in the mind; in the other it is the external *objective* changes measured by sun and moon. The truth is that Locke, although he is not very clear and definite about what he is doing, actually lays out the two views which later culminate in the controversy of Bergson and Einstein. He believes in mental time and in physical time, and leaves the matter there, the subjectivity and objectivity unrelated and unreconciled, the psychological contrasted with the physical, but not related or unified by any metaphysic of time such as would blend the idealistic and realistic truths into a positive idealism.

Although he does not do this, Locke is shrewd enough to indicate certain general difficulties about time. While time is bound up with the changes of heavenly bodies, nevertheless subjectivity and relativity are both involved even in this seemingly objective view of it. This arises because we can never be sure that two lengths of duration are really equal. Our measures of duration cannot, any of them, be demonstrated to be exact. Since no two portions of succession can be brought together, it is impossible ever certainly to know their equality. This is a most interesting forecast of the difficulties of time-measurement. "All that we can do for a measure of time",

¹ *Essay*, Bk. II. 14.

continues Locke, "is to take such as have continual successive appearances at *seemingly equidistant* periods; of which seeming equality we have no other measure but such as the train of our own ideas have lodged in our memories with the concurrence of other probable reasons to persuade us of their equality."¹ Having noticed that we have no satisfactory basis for time-measurement, Locke concluded that, in spite of some variations, our own general estimates of time do roughly correspond with the objective flow of events. He points out that in our waking moments our ideas "succeed one another in our minds at certain distances not much unlike the images in the inside of a lanthorn turned round by the heat of the candle. This appearance of theirs in train, though perhaps it may be sometimes faster and sometimes slower, yet I guess varies not very much in a waking man."²

Quite so; but Locke overlooks how Barrow treated this very point. Barrow, too, saw the impossibility of measuring two temporal durations by side-by-side comparison (just as one of our most recent writers, Cassirer, has done) because, in time, durations succeed each other and so pass away. They never stand, as it were, for us to measure them. Barrow saw that King Sol might be an untrue guide to equal durations, but he went on with more precise scientific insight than Locke to say, not that we must fall back on the *subjective standard of our own ideas* or other probable reasons, but that we then must fall back on precise *instruments*.³ It is on this line that the physical treatment of time has developed independently. Having admitted the utter unreliability of our personal awareness of time, Locke, rightly feeling the difficulty about the motions of the heavens, was very foolish to suggest falling back on subjectivity as a corrective or a guide.

Although, as it were in spite of himself, Locke is forced to bring out the contrast of subjective mental time and the objective physical time, and although he lived in an age in which scientific invention and mathematical precision were growing (under the initial influence of Galileo's work and methods), yet he failed to see that objective physical time would come to be investigated by physicists by strictly physical

¹ Locke, *Essay on the Human Understanding*, Bk. II, Chap. IV.

² *Ibid.*, Bk. II. 14.

³ *Ibid.*, Bk. II. 14, 21.

methods which are purely quantitative. He was unable to conceive of the advance of precise instruments to measure such fractions as $\frac{1}{1,000,000,000}$, as in the case of the Michelson-Morley experiment. He was unable to see that such methods would develop in their own sphere independently of the discussion of subjective mental time. In short, Locke could not anticipate the developments which separately led to the equations of Einstein on the one hand, and a conception such as that of the *durée* of Bergson on the other.

“‘Duration in itself’ must, therefore”, he sums up, “be distinguished both from duration as immediately experienced and from time or objectively measured duration, since it is to be considered as going on in one constant equal uniform course.”¹ This sentence has sources which are obvious. Newton’s *Principia* appeared in 1686, Locke’s *Essay* in 1690. His distinction between “duration itself” going on “in one constant equal uniform course”, and time as measured duration—measured, that is, by the motion of heavenly bodies—is Newtonian even in its terminology. Locke follows and repeats Newton’s expression of the difficulties involved in measuring time with absolute accuracy and in the consolatory view that in any case such difficulties are only in our methods of measurement and in no way take away from the even tenor of the course of the one absolute and mathematical Time.

We have shown that in spite of all this Locke’s merit lies in having clearly set out the contrast of psychological and physical time. He also appears as a pioneer in his grasp of the distinction between time as a percept and Time as a concept. This is a distinction very vital in any metaphysic of Time. Locke sees that we become aware of time by experiences in which we observe, together with duration and succession, certain discontinuous, qualitative distinctions. Yet from our perceptual experience, once gained, we elaborate a concept of Time. He recognizes that characteristics which are true of the percept may not be true of the concept. We never perceive the whole of Time, but only finite and extended portions of it, and these are broken portions (owing to the interference of sleep and to the limit of our existence here). Our conceptual Time is, however, uniform and continuous, infinite in extent

¹ Locke, *Essay*, Bk. II. 14.

and infinitely divisible. The concept of Time is built up by powers of abstraction and synthesis and is intimately connected for Locke with our notion of infinity.¹ Except in so far as we attribute infinity to the Deity, where it is used in a qualitative sense, the word refers to quantity. We can perceive a quantity of time-stretch, and by repeating this in the mind indefinitely we come to conceive of Time (like Space and Number) as infinite, for if one undertakes such an operation, as Locke puts it, a man "has no more reason to stop, nor is one jot nearer the end of such addition than he was at first setting out".² We can, indeed, neither find nor conceive any end, and we thus regard Time as endless or infinite. By a similar process, substituting division for addition, we arrive at the notion of the infinite divisibility of time.

Now this is, within limits, a true account of the way we do form our conception of Time, but Locke does not sufficiently realize how far such a concept carries us from reality as *perceived*. The concept contradicts the percept in several ways, but Locke offers us no solution of this difficulty. It may well be that perception is inadequate as a guide to reality, but Locke does not face this difficulty directly. He appears to be more concerned with claiming that even our conceptions are not adequate to Reality. This, of course, is another point, and a perfectly legitimate one; but Locke leaves the description of perceptual time and conceptual time to its own fate, just as he left the description of mental and physical time. His genius lay, not in offering solutions of these problems or even in bringing out their relationship (which he hardly attempts at all), but rather in enunciating the distinctions.³

¹ Locke, *Essay*, Bk. II. 15, 10.

² *Ibid.*, Bk. II. 17, 3.

³ It is interesting to note that after treating of Space and Time separately, Locke devotes a chapter to their joint consideration, a suggestion ignored by Kant and not taken up until the work of Palágyi, Minkowski, and, of course, notably Alexander. Locke says: "Expansion and duration do mutually embrace and comprehend each other, every part of space being in every part of duration and every part of duration in every part of expansion. Such a combination of two distinct ideas is, I suppose, scarce to be found in all that great variety we do or can conceive, and may afford matter to further speculation." (Locke, *Essay*, Bk. II, Chap. XV, "Of Duration and Expansion considered together," § 12.)

VI

Locke's treatment of Time, in spite of its subjective aspects, rather presupposes Absolute Time than constitutes any refutation of it. The real criticism came from Berkeley. He argued that all motion is relative and not absolute. The conception of absolute motion was, in his view, both an unnecessary and impossible concept. He also maintained, in opposition to Newton, that space and time are relative and, in opposition to Locke, that they consist of particular points and instants. Time he regarded as an experienced succession of ideas. Locke had remarked that this succession of ideas is the vital element in our experience of time. The same writer claimed that time in its own nature, pure and absolute, could only be measured by us through our succession of ideas, yet for him *this measure of succession is only a measure of time; it does not in itself constitute time*. Berkeley, however, claimed that we cannot distinguish thus between time and its measurement, for time, he urged, does not exist apart from this succession of ideas we experience. Pure Time and Time in general are merely abstract fictions.

Equally he disagreed with Newton's Absolute Time. This true, absolute, mathematical Time is an unnecessary conception, unessential for everyday life, unessential for the physicist and logically unintelligible. We can form no notion of Absolute Time. For us all time is relative. It consists of particular instants, or passing sensations in the minds of percipient beings and is entirely relative to the percipients. If, indeed, the succession of ideas is more rapid in one mind than another then the lives of the two men vary. Time then is subjective, relative, and private, but Berkeley admits that for God there exists a standard, normal absolute Time. But in general time admits of no common measurement, it differs from man to man and in the same man according to whether he is pleased or pained.

In his *Principles* he confesses his difficulties frankly: "For my own part, wherever I attempt to frame a simple idea of *time* abstracted from the succession of ideas in my mind, which flows uniformly and is participated in by all beings, I am lost

and entangled in inextricable difficulties. I have no notion of it at all.”¹ In the succession of ideas lies, for him, the actual essence of time, not merely its “sensible measure”. Such time is not empty, for there can be no such thing as empty time, nor is it infinitely divisible and discrete. Apart from succession of ideas, he repeats, “I have no notion of time at all, only I hear others say it is infinitely divisible and speak of it in such a manner as leads me to harbour odd thoughts of my existence; since that doctrine lays one under an absolute necessity of thinking, either that he passes away innumerable ages without a thought, or else that he is annihilated every moment of his life, both which seem equally absurd.” Time is, then, for Berkeley, merely a sensation of mind. Duration and existence he declared identical, hence the *esse* of his *tempus* is *percipi*, and by an easy step to his *esse est percipi*, i.e. the assertion of subjective idealism that all existence is mind-dependent. Finding himself unable to accept the conception of Absolute Time, he makes the mistake of finding refuge in complete subjectivity by denying any objective time at all and equating time merely with the subjective succession of ideas.²

VII

The Newtonian conception of Absolute Time was further attacked by Leibnitz, who, unknown to his contemporaries, was writing in his *Nouveaux Essais* a critical examination of Locke’s *Essay*. This manuscript he finished in 1704, but it was not published until 1765, long after his death. In these *Essays* he recognizes a concreteness about time which is inconsistent with the abstract Newtonian conception. At the same time he recognizes its “ideal” character in the sense that it is as independent of objects as number is independent of things numbered. This doctrine of the ideality of time is not consistently maintained by Leibnitz, and we occasionally find him mingling his terminology, as Spinoza did, by using “time” and “duration” as synonymous terms, although elsewhere he makes a great distinction between them. In other writings, to

¹ Berkeley, *Principles of Human Knowledge*, 98.

² In the main this same criticism applies to Bergson.

which we shall presently refer, he distinguishes fundamentally time and duration. For him every existing object has its own duration but not its own time. Duration is thus regarded as an attribute of existing things which Time, as outside and independent of things, serves to measure.

In 1715, five years after Berkeley published his attack on Newton in his *Principles*, Leibnitz wrote a letter to Princess Caroline of Wales (later the wife of George II) in which he joined in the attack on Absolute Space, Time, and Motion. He regarded Absolute Time, with its constant flowing moments, as a fiction, and maintained a Relational Theory. Time for Leibnitz was purely relative and was an order of succession. The princess requested Newton to take up the challenge, which he declined to do personally, but he asked his disciple and friend, Dr. Samuel Clarke, to reply to Leibnitz. This correspondence was a philosophical event of some importance. Ten letters were written, five on each side, and the correspondence only terminated by the death of Leibnitz in the following year. In 1717 Clarke published the ten letters. They contain many interesting arguments, some of which approximate to those employed at a later stage in physical and philosophical development, in connection with the Theory of Relativity. Clarke, for example, in endeavouring to refute the Leibnitzian conception of time as an order of succession and space as an order of co-existences, remarks that, if space were only the order of co-existent things, then, if God were to make the universe move in a straight line with any velocity, we would still be in the same place and no difference would be experienced—a remark which is akin to some of Bergson's arguments in regard to mathematical time, and also related to the doctrines of Poincaré, the work of Michelson and Morley, and, of course, Einstein himself. Leibnitz maintained a relativist position.

According to the Absolute Theory all temporal relations between events arise from a combination of two distinct factors:

1. The relation of an event to the moment of time which it occupies.
2. The relation of succession between the moments of time.

According to the Relative Theory, however,

1. There are no moments.
2. Temporal relations hold between events.

Both of these theories put forward more than is given in our experience. In our experience of time we know *events* (of finite duration) and *relations* of (partial) precedence or succession. The Relative Theory replaces these by *momentary* events possessing no duration, and for the relations given in experience it substitutes relations of total precedence and of simultaneity. The Absolute Theory removes us still farther from our immediate data of experience by the introduction of other entities, moments which have *no* duration and stand in relations of total precedence but never of simultaneity. Nor is this all, for it introduces the further difficulty of the relation between an event and the moment of time which it occupies. If it is found that events of finite duration together with their relations of partial precedence are adequate to our purposes, the whole postulation of the existence of moments would appear unnecessary.

Events are the basis of our temporal experience, and even if the necessities of the concept of time force us into an analytic abstraction such as momentary events, or in Whitehead's terminology "point events", it must be remembered that perceptually time is always composed of amounts of time, i.e. durations which are not merely momentary. It is impossible to get duration from the succession of non-durational moments, and it must be recognized that, however useful is the concept of the point or point-event, a line is not made up of points which are non-extensional, nor is time made up of moments which are non-durational, i.e. which have no extension in time. This discussion involves the distinction to be raised later, of time as concept and as percept between which there are distinct differences; for while infinite divisibility is asserted of the concept, the perceptual character of time involves, as psychological experiment has proved, some minimum of duration, below which time for us cannot be further subdivided. This was a point on which Hume laid stress, as we shall see in our next section.

For Leibnitz there are no moments, and temporal relations hold between events themselves. Time is not absolute, but

relational in character. In his third letter to Clarke, Leibnitz states that, in his view, time is an order of successions, and that time is not distinct from things existing in time. "Instants considered without the things are nothing at all."¹ They consist, he claims, only of the successive order of things. Similarly space is an order of co-existences. In his fourth letter he attacks Newton's notion of space and God by pointing out that "space is the place of things, and not the place of God's ideas". "The author" (Dr. Clarke) "contends that space does not depend upon the situation of bodies. I answer: 'Tis true it does not depend upon *such* or *such* a situation of bodies, but it is that order which renders bodies capable of being situated and by which they have a situation among themselves when they exist together, as time is that order with respect to their successive position. But, if there were no creatures, Space and Time would be only in the ideas of God.'"²

Clarke, adhering to the Absolute Theory, claimed that a Relative Theory such as that of Leibnitz would involve the abandonment of any quantitative aspect of time and space. To this (in his fifth and last letter) Leibnitz replies: "As for the objection that Space and Time are quantities, or rather things endowed with quantity, and that situation and order are not so, I answer that order also has its quantity; there is in it that which goes before and that which follows; there is distance or interval. Relative things have their quantity as well as absolute ones. For instance, ratios or proportions in mathematics have their quantity and are measured by logarithms, and yet they are relations. And therefore time and space consist in relations, yet they have their quantity. Time must coexist with creatures and is only conceived by the order and quantity of their changes."

Leibnitz considers that while the world may be limited in spatial extension, it may be unlimited in temporal extension. But it does not follow from this, he argues, that it had no beginning. The infinity is future, not past. "If it is the nature of things in the whole to grow uniformly in perfection, the universe of creatures must have had a beginning. Therefore there will be reasons to limit the duration of things even

¹ Leibnitz, *Philosophical Works* (Duncan's ed.), p. 243; same, par. 41, p. 252.

² *Ibid.*, Letter IV, par. 41 (Duncan's ed.), p. 252.

though there were none to limit their extension." He considers it reasonable to believe that the world had a beginning, and is at pains to point out, like Plato and Augustine, that such creation would be also the beginning of Time. Time is co-existent with things, and before things there could be no time; hence to suggest that the world might have been created sooner is to ask "nothing that is intelligible", and to suppose a chimerical thing. Time without things is nothing but a mere ideal possibility. "When", says Leibnitz, "I speak of this world I mean the whole universe of material and immaterial creatures taken together, from the beginning of things. But if anyone mean only the beginning of the material world and suppose immaterial creatures before it, he would have somewhat more reason for his supposition; for time then being marked by things that existed already, it would be no longer indifferent and there might be room for choice. And yet, indeed, this would be only putting off the difficulty. For supposing the whole universe of immaterial and material creatures together to have a beginning, there is no longer any choice about the time in which God would place that beginning or in saying that He created things 'at what time He pleased', for that particular time without the things is an impossible fiction." In our modern phrase, Time begins with the creation of things or with events, the existence and duration of things being, of course, themselves events. Time must co-exist with created things and is only conceived or known at all by the *order* and *quantity* of their changes.

Leibnitz attacks the doctrine of absolute motion. For him motion is a change of relations. Clarke accused him of suggesting that motion only existed if it were observed. This subjectivism Leibnitz rigorously denies, and his remark may be again recalled and applied to the later controversy about real time as only that which is *perçu et vécu*. Leibnitz does not fall into such a pure subjectivism; he has a healthy and legitimate belief in a world existing objectively and independently of our perception of it. He is not anxious to equate motion with our awareness of it, or time with our awareness of time. Motion, he says, does not, indeed, depend upon being observed, but it does depend upon being possible to be observed. There must, in short, be some change, whether observed or not, but

which could be observed. If there be no change which could be observed (under any conditions), then there is no change at all and so no motion. Leibnitz believed in the reality of change, but not of time. The monads are conceived by him as timeless, for all their states are eternally contained in themselves. Further, Time and Space cannot be conceived as in God or as properties of God. He stands in no need of them; they are not necessary to Him. Duration is not eternal, for "how", he asks, "can a thing exist whereof no part does ever exist?" Then rather paradoxically he remarks: "Nothing of time does ever exist but instants, and an instant is not even itself a part of time. Thus Time can only be an ideal thing."

The contrast between the Absolute view of Newton and the Relativist doctrines of Leibnitz aroused considerable interest in the eighteenth century, and no little controversy. The Time problem was discussed by such diverse minds as Reid, Toland, Voltaire, D'Alembert, Condillac, and, of course, Hume, whose criticism is highly important. Toland, who was in part a pupil of Locke (who disowned him for religious reasons), became an ardent supporter of the views of Leibnitz, as was seen in his *Pantheisticon* of 1720.

Reid, representing the Scottish School of "Common Sense", referred in a general manner to the Time problem in his *Essays on the Intellectual Powers of Man* (1785), a work which was put forward as an objection to the over-speculation of Hume, which led only to pure scepticism. Reid endeavoured to direct attention to the psychological and metaphysical problems involved in our actual experience of time. He devoted two chapters to the subject of Time in his *Essays on the Intellectual Powers of Man*, one on "Duration", the other being a "critique of Mr. Locke's account of the origin of our ideas, and particularly of the 'Idea of Duration' ".¹ Both of these chapters are sections of the "Essay on Memory", and this—in itself significant—is emphasized by his opening assertion that "our notion of duration as well as our belief of it is got by the faculty of

¹ Chaps. III and V respectively of the Third Essay, "Of Memory", pp. 342-4 and 346-50 of Hamilton's edition as re-issued (Fourth Edition, Edinburgh, McLachlan & Stewart, 1854). See also conclusions of Chap. II for interesting remarks on Past, Future, and Deity.

memory". We may, however, take his critique of his predecessor first before following his own treatment. After criticizing Locke's ambiguous use of the term "reflection", and by this ambiguity having "darkened and perplexed" his account, Reid takes the English thinker to task for his remarks about duration and succession. "Reflection", said Locke, "upon the train of ideas which appear one after another in our minds is that which furnishes us with the idea of succession; and the distance between any two parts of that succession is that we call duration." To this Reid replies, in conjunction with Price, that succession presupposes duration and that the idea of succession should be derived from that of duration and not *vice versa*, as Locke puts it. Reid believes that there is a conception of duration where there is no succession of ideas in the mind.¹ Further, he points out that no sum of non-durational elements will give a duration, as the multiplication of nothing cannot produce something.

With regard to our subjective and unreliable estimates of time Locke had stated that the same period of duration appears long to us when the succession of ideas in our mind is quick, and seems short when the succession is slow. Reid shows that the contrary is the truth. He quotes on this point a military testimony to the effect that action in battle appears to the soldier much shorter than it really is. Yet I cannot think, he says, that the succession of ideas was then slower than usual.²

The idea of motion, Reid claims, depends on memory, as a successive change of place could not be observed without its aid. This is inexact, for we do have perception of change. He regarded our idea of duration as arising from memory, but his brief statement suffers from the lack of discrimination not only between time as perceptual and as conceptual, but also between the objective facts of past and present and the subjective awareness of them in memory and presentation. Nevertheless he establishes some points which are of interest. Duration is continuous quantity and is infinitely divisible. With regard to the problem of divisibility, he claims that we must acknowledge that time is divisible without end or limit, but that there are

¹ Reid, *Essays on the Intellectual Powers of Man*, Essay III, Chap. V.

² Another war testimony on this same point is given by a soldier quoted in Miss Sturt's *Psychology of Time*.

limits beyond which our faculties cannot divide. Reference to conceptual time on the one hand and perceptual time on the other would have clarified Reid's views here. One of his statements appears to imply a quite definite belief in Time as existing apart from events. "The duration of events which we remember leads us necessarily to the conception and belief of a duration which would have gone on uniformly though the event had never happened."¹ Reid is inclined to view Time as a concept "given us by some original power of the mind". He touches on the old problem of Time's beginning, and remarks that we can conceive a beginning of the sensible measures of time (e.g. revolutions of the earth) and say that there was a time when they were not, a time undistinguished by any motion or change; but to say that there was a time before all Time is a contradiction.

Reid pointed out that we are prepared to allow to the Deity the perfect possession of a faculty we ourselves in some degree possess, like knowledge of the past, but that we are not prepared to allow to the Deity the possession of a faculty we have not got at all, such as knowledge of the future.² He suggests that had we been given a knowledge of the future and not of the past we would have found it difficult to conceive of a Being who knew the past.³ He puts forward what Hamilton described as "a marvellous doctrine", the view that it is as difficult to claim knowledge of the past actions of a free agent as to claim knowledge of his future actions. Hamilton rightly urges that the two cases are not the same. "The *past*, as past, whether it has been the action of a free agent or not, is now necessary, and though we may be unable to understand how it can be remembered, the supposition of its remembrance involves no contradiction. On the contrary, the future action of a free agent is *ex hypothesi* not a necessary event. But an event cannot be now certainly foreseen except it is now *certainly* to be, and to say that what is *certainly* to be is not *necessarily* to be seems a contradiction."

¹ Reid, *Works*, p. 343.

² Basing his claim upon dream experiences, J. W. Dunne claims, in an intriguing way, that we do know the future, our dreams being partly past and partly future in content (*An Experiment with Time*).

³ Reid, *Works*, p. 342. "Essay on Memory", Chap. II, in *Essays on the Intellectual Powers of Man*.

Reid writes an interesting paragraph on time and space which might have been penned by Alexander. "All limited duration", he says, "is comprehended in time and all limited extension in space. These, in their capacious womb, contain all finite existences but are contained by none. Created things have their particular place in space and their particular place in time, but time is everywhere and space is at all times. They embrace each the other and have that mysterious union which the Schoolmen conceived between soul and body. The whole of each is in every part of the other."¹

Finally, Reid expresses himself as rather sceptical of the conceptions of Eternity and Time enunciated by the Schoolmen and by Newton and Clarke. He shrewdly doubts if they are "as solid as they are sublime".

Hamilton in his footnotes to Reid's work claims that if certain passages in Reid be interpreted as indicating a belief in Time as an empirical notion or a necessary generalization from experience, this is really contrary to Reid's own doctrine that experience can give us no *necessary* knowledge. If, however, it be a necessary and original notion, the account of its origin (and that of space) is incorrect. Reid should have said, asserts Hamilton, that experience is not the *source* of their existence, but only the occasion of their manifestation. The problem here involved is, of course, one which Kant attacked.²

Elsewhere the development took other lines, such as in the introspective psychology of Maine de Biran, in which the germ of Bergsonism is to be found, and in Germany in Kant. Both Kant and Hume, of course, demand our special treatment.

Among the discussions of the period of Voltaire we find D'Alembert remarking, in the Preface to his *Dynamique* (1743): "Le temps de sa nature coule uniformément et la mécanique suppose cette uniformité." This is orthodox Newtonism. Some years later (1754) he made reference to the suggestion of a friend that time is really a fourth dimension, but the suggestion

¹ Reid, *Works*, p. 343. The reference to soul and body is particularly interesting in view of Alexander's phrase "Time is the Mind of Space" (*Space, Time, and Deity*).

² Hamilton refers to the discussions in Cousin's treatment of Locke (*Cours de Philosophie*, II. 17 and 18), Royer-Collard's *Fragments* (IX and X), and Stewart's *Philosophical Essays* (II. 2). There were, of course, intimate relations between the work of Locke, Condillac, Cousin, and also between the whole of the Scottish School and French thought of Cousin's time.

was not developed. Condillac, whose *Traité des Sensations* was written in a spirit akin to that of Locke, speaks in the first part of his work of the relativity of our awareness of the duration of time and the consequent subjectivity of this. "La notion de la durée est donc toute relative; chacun n'en juge que par la succession de ses idées; et vraisemblablement il n'y a pas deux hommes qui, dans un temps donné comptent un egal nombre d'instants. Car il y a lieu de présumer qu'il n'y en a pas deux dont la mémoire retrace toujours les idées avec la même rapidité."¹

Commenting on this, Brunschwig aptly says: "Cette remarque fait penser à la thèse de M. Bergson touchant l'originalité caractéristique de la durée individuelle; mais s'appuyant sur la psychologie atomistique, dont M. Bergson a si profondément démasqué l'inconsistance, Condillac rattache la différence des rythmes intérieurs à la numération d'instants supposés discontinus, non à la continuité mélodique de la conscience."²

Wolff, in his *Ontology*, mainly followed Leibnitz, and in the Wolff-Leibnitzian philosophy, which was current in Germany up to Kant's time, the definition of Time was Leibnitzian in character, regarding it as "an order of successions in a continuous series". Leibnitz raised the problem to a definite issue between the Absolute and Relativist views, and several subsequent writers have not only paid tribute to his criticism of Newton as the beginning of the attack on these conceptions, but have seen in the recent trend of physics and of the philosophy of science a return to the conceptions of the "idealism" and relativity doctrines of Leibnitz. Hume, by his incisive criticism, carried the development a stage further and by his work directly stimulated Kant.

VIII

The criticism put forward by Berkeley and Leibnitz against the Newtonian conception of Absolute Time was carried to a further stage by Hume, who undoubtedly had read the Clarke-Leibnitz correspondence, but preferred, in view of the

¹ Condillac, *Traité des Sensations*, I, iv.

² Brunschwig, *L'Expérience humaine et la Causalité physique* (1922), p. 496.

great English veneration for Newton, to remain silent about Leibnitz.¹ Like Berkeley, Hume found himself unable to conceive of Time in the abstract, and he views it as merely due to the succession of ideas in the mind, while Absolute Time he rejects as a pure fiction. Hume rushed hurriedly into publication with his *Treatise* in 1739, at the age of twenty-five, and never revised it, while he omitted, we may note, from his later *Enquiry*, all discussion of both space and time.

He turned his critical intellect to the problem of Time in the second part of his *Treatise on Human Nature*. First of all he emphatically rejects the view that time is infinitely divisible, "No finite extension is capable of containing an infinite number of parts, and consequently no finite extension is infinitely divisible." This view he applies equally to space and time, and as applied to time, it is equivalent to an assertion that time is made up of elements which have a definite duration. The mathematical point is a mere fiction. The essence of time lies in succession. "'Tis a property inseparable from time, and which in a manner constitutes its essence, that each of its parts succeeds another and that none of them, however contiguous, can ever be co-existent. For the same reason that the year 1737 cannot concur with the present year, 1738, every moment must be distinct from and posterior or antecedent to another. 'Tis certain, then, that time as it exists must be composed of indivisible moments. For if in time we could never arrive at an end of division, and if each moment as it succeeds another were not perfectly single and indivisible, there would be an infinite number of co-existent moments or parts of time, which I believe will be allow'd to be an arrant contradiction.'" ² Returning to this point a few pages later he says: "No one will ever be able to determine by an exact numeration that an inch has fewer points than a foot."³ And so "infinite divisibility is utterly impossible and contradictory."⁴

This, however, is by no means the most important point in his treatment. Allowing for the present his view that time cannot be infinitely divisible, we turn to the crucial consideration of moments and ask, "What are they?" His answer is that

¹ Hendel, *Studies in the Philosophy of David Hume* (1925).

² Hume, *A Treatise on Human Nature*, Vol. I, Pt. 2, sec. 2, p. 338. Green's edition.

³ *Ibid.*, p. 351.

⁴ *Ibid.*, p. 346.

they are nothing at all. To suppose that they are anything in themselves is to misconceive entirely the nature of time and the manner in which we arrive at the idea of time. Time or a moment of time is nothing at all in itself. It is not a quality or an entity. Time or a moment of time is nothing apart from a thing or an event. "The indivisible moments of time must be filled with some real object or existence, whose succession forms the duration, and makes it conceivable by the mind."¹

Absolute Time is a fiction; there is no time and no awareness of time apart from succession of events. "From the succession of ideas and impressions we form the idea of time, nor is it possible for time alone ever to make its appearance or be taken notice of by the mind. A man in a sound sleep, or strongly occupy'd with one thought, is insensible of time; and according as his perceptions succeed each other with greater or less rapidity, the same duration appears longer or shorter to his imagination. It has been remark'd by a great philosopher,² that our perceptions have certain bounds in this particular, which are fix'd by the original nature and constitution of the mind, and beyond which no influence of external objects on the senses is ever able to hasten or retard our thought. If you wheel about a burning coal with rapidity, it will present to the senses an image of a circle of fire; nor will there seem to be any interval of time betwixt its revolutions; merely because 'tis impossible for our perceptions to succeed each other with the same rapidity that motion may be communicated to external objects. Wherever we have no successive perceptions, we have no notion of time, even tho' there be a real succession in the objects. From these phaenomena, as well as from many others, we may conclude that time cannot make its appearance to the mind, either alone or attended with a steady unchangeable object, but is always discover'd by some *perceivable* succession of changeable objects."³

"The idea of time is not deriv'd from a particular impression mix'd up with others, and plainly distinguishable from them; but arises altogether from the manner in which impressions

¹ Hume, *A Treatise on Human Nature*, Vol. I, p. 345.

² "Mr. Locke (*Essay* II, Chap. XIV, sec. 9.—Ed.)."

³ Hume, *A Treatise on Human Nature*, p. 342.

appear to the mind, without making one of the number. Five notes play'd on a flute give us the impression and idea of time, tho' time be not a sixth impression, which presents itself to the hearing or any other of the senses. Nor is it a sixth impression, which the mind by reflection finds in itself. These five sounds making their appearance in this particular manner, excite no emotion in the mind, nor produce an affection of any kind which being observ'd by it can give rise to a new idea. For *that* is necessary to produce a new idea of reflection; nor can the mind, by revolving over a thousand times all its ideas of sensation, ever extract from them any new original idea, unless nature has so fram'd its faculties that it feels some new original impression arise from such a contemplation. But here it only takes notice of the *manner* in which the different sounds make their appearance; and that it may afterwards consider without considering these particular sounds, but may conjoin it with any other objects. The ideas of some objects it certainly must have, nor is it possible for it without these ideas ever to arrive at any conception of time; which, since it appears not as any primary distinct impression, can plainly be nothing but different ideas, or impressions, or objects dispos'd in a certain manner—that is, succeeding each other.”¹ “The parts, into which the ideas of space and time resolve themselves, become at last indivisible; and these indivisible parts, being nothing in themselves, are inconceivable when not fill'd with something real and existent. The ideas of space and time are therefore no separate or distinct ideas, but merely those of the manner or order in which objects exist.”²

Time, therefore, according to Hume's view, is not known by itself, but always by perceived succession. The idea of succession, as further claimed by him, is always derived from a succession of changeable objects and can never be conveyed to the mind by any object which is steadfast and unchangeable. He also argues that not only can the idea of duration not be obtained from a steadfast object, but that the idea should never be applied to it. Duration does not contradict or exclude succession; it necessarily implies it, and this succession is essentially a succession, not of the bare moments of a supposed absolute time, but of events.

¹ Hume, *A Treatise on Human Nature*, p. 344.

² *Ibid.*, p. 346.

Hume insists that the indivisible moments of time must be filled with some real object or existence whose succession forms the duration and makes it conceivable by the mind. For him our *perception* of time is nothing but a product of our mental disposition in relation to events and change, while our *conception* of time is purely a work of the imagination. We are wrong, Hume asserts, in thinking that we can form the idea of a time and duration without any change or succession—in fact, we can neither perceive nor conceive time apart from change, and it is our experience of change which produces in us the notion of time which, in his view, is purely subjective. In his own mind this notion of time is hardly to be distinguished from a fiction.

In his effort to abolish Absolute Time Hume leaves us with no notion of Time at all, and his own radical empiricism prevents his doing more than achieve a destructive criticism. Even that is confused and rests upon methods open to criticism, while he makes no attempt to relate our experience of time to events or things. He presents the case for time as practically a choice between admitting it as a sixth sense (which is impossible) or as nothing at all. Beginning with a discussion of infinite divisibility and then with a legitimate attack on empty "moments", he arouses our hopes but leaves us in the end quite empty handed. We expect some constructive view of time, some new insight into it, different from the conceptions of Newton and Barrow, but we get nothing save the vaguest subjectivism, which is merely a cover for scornful scepticism. Hume assumed, in regard to time, an attitude similar to that which he adopted towards his main problem, causality, and refused to time, as Berkeley had done, any reality save that of a succession of ideas.¹ Merely successive impressions, however, cannot alone be held to account for the awareness of succession. Successive impressions might be perceived by a creature having no time-consciousness. Succession is not by itself time; some account must be taken of duration and of the continuity felt in our time-experience. Successions are a feature of time rather than time itself. Hume and Berkeley imagine time to be made up of discrete moments, each moment being, as Locke puts it, "the time of one idea in our minds".² This implies that

¹ Hume, *Treatise*, II. 3.

² Locke, *Essay*, Bk. II. 14, 9.

our experience can be entirely described in terms of trains of discrete ideas, which is not the case.

The truth is that Hume's difficulties about time arose from his unbelief in the unity of the self and in the unity of the world, owing to the unsatisfactory foundation of his philosophy in "impressions". As Green well says in his criticism, Hume "plays so fast and loose with the meaning of 'impression' as to hide the contradiction which is involved in the notion of a 'compound impression', if impression is interpreted as feeling—the contradiction, namely, that a single feeling should be felt to be manifold—and in consequence loses the chance of being brought to that truer interpretation of the compound impression as the thought of an object under relations, which a more honest trial of its reduction to feeling might have shown to be necessary".¹

Hume derives the notion of time "from the succession of our perceptions *of every kind*, ideas as well as impressions and impressions of reflection as well as succession". The portions of time cannot co-exist, and as "time itself is nothing but different ideas and impressions succeeding each other", these portions of time are evidently those perceptions of every kind from which we derive the notion of time. Although rejecting the distinction of "impression" and "object", he actually relies on it, and in this way endeavours to overcome the contradiction involved in declaring certain impressions to be co-existent (space) and then maintaining that *all* impressions are successive (being parts of time).

It is impossible to reach a doctrine of perceptual time, much less one of conceptual time, on Hume's "impressionist" treatment of experience. Time implies more than succession, even time at the perceptual level, while the concept of Time is formed by mental synthesis. Although the impression, sensation, or feeling of one moment is past before another impression begins, these are synthesized by the self, which is thus able to realize a relation of succession and a sum total of events happening in sequence or order. Still farther is he from the realization that this synthesis is but the mental awareness of that objective sequence of events given by the happenings of the outer, objective world.

¹ T. H. Green, General Introduction to *Hume's Works*, Vol. I, p. 205.

The notion of time arises from our experience of the outer world of change, and this experience itself can only arise in relation to a self which is not itself pure change, but to which these successive changes are presented. This does not mean the adherence to a purely subjective view of time, which would be untrue. It does mean, however, that even the subjective view, inadequate as it is, is more adequate than the view of Hume, who wishes us to consider and reject the view that it is a sixth sense, only to agree that it is nothing, not even an impression, not even a valid figure of speech. Even this he does not, and cannot, consistently maintain, and his vague references to the notice the mind takes of "impressions" contradict his view that time itself is not an impression. This "notice" is itself something, and had Hume taken this more seriously, he might have had a clue to the nature of the self, its perception of change and of time, and its nature considered from the subjective side only. But, as we have already said, he does not even attain to a grasp of subjective time, and his quaint discussion of time in relation to the imagination in Part III of his *Treatise* adds nothing to his views, which rest inadequate, destructive, and sceptical, possessing merely the value of legitimate onslaughts on the Newtonian conception of Absolute Time and Absolute moments.¹

It was reserved for another thinker, Kant, who read Hume with Leibnitz in mind and read Leibnitz with Hume in mind, and who was also acquainted with Newton's ideas, to carry on to another stage the investigation of Time. How far he succeeded we shall discuss in our following chapter. His problems were laid down by the development we have outlined in this chapter, especially in regard to Newton and Locke. The problem for metaphysics was the problem of Locke, namely that of determining the value of Galileo's purely objective attitude to time and the subjective view of it as an

¹ It is interesting to note that Schlick, in his work on *Space and Time in Contemporary Physics*, definitely connects the name and work of Hume with contemporary discussions. "Einstein's analysis of the conceptions of space and time belongs to the same category of philosophic evolution as David's Hume's criticism." (Schlick, *Space and Time in Contemporary Physics*, English ed., Brose, p. 87.) There are also some affinities between Hume's stress upon the conceptual value of the imagination (i.e. its assistance in forming concepts) and the doctrines of Alexander in certain sections of his *Space, Time and Deity*. Alexander, *Space, Time and Deity*, Vol. I, pp. 152, 166-8, 222-4; Vol. II, p. 147.

“inner sense”. In brief, the important question now open was: How do we place events in a single neutral-time order, and distinguish between the order in which we happen to get our sensations and the order in which the events that we perceive by these sensations happen? This was the fundamental question, and it involved the metaphysical discussions which Kant boldly but unsatisfactorily undertook in connection with time and cause, and was to involve after his time the whole problem of time-measurement and motion as well as the qualitative treatment of time as purely subjective—in short, the physical and the mental views of time which face the contemporary metaphysician.

CHAPTER IV

TIME IN THE PHILOSOPHY OF KANT AND HIS SUCCESSORS

Growth of Kant's ideas on Time. Physics left behind for Transcendental Metaphysics. Time is nothing by itself. It is a form of our intuitions. The inner sense. Time in relation to number and counting. Succession its fundamental feature. Duration and simultaneity. Relation of Time and Space. Difficulties inherent in Kantian doctrines. The Antinomy of Time. Time as *a priori*. True reasons for this. Time and Phenomena or Events. Criticism of Kant's doctrines. Futility of his treatment of Time and Causality seen in critical examination of "Analogies of Experience". Views of some post-Kantian thinkers, Schopenhauer, Hegel, Lotze, Renouvier's neo-criticism, Spencer, Shadworth Hodgson. The criticism of Sigwart. He raises problems of Time-measurement.

I

REACTION against the doctrines of Hume was the main note in the philosophy of the Scottish School which produced Reid, Stewart, and Hamilton. The epoch-making reaction against Hume, however, was instituted by Kant with his Critical Philosophy. It is with Kant that the difficulties in regard to Time, noticed by Locke, came to be clearly stated in philosophy, but a century elapsed after Kant before Time came to be generally recognized as a crucial problem for philosophy.

Kant's work was a direct reply to Hume, whose writings awakened him from a dogmatic slumber of confidence in the doctrines of the Leibnitz-Wolffian School which dominated Germany and German textbooks on philosophy at that time. In the *Critique of Pure Reason* Kant endeavoured to overcome the momentary and separate view of successions described by Hume by reference to the abiding synthetic unity of consciousness which Hume so definitely avoided and rejected. Kant considered that Time must, as a form or notion, be logically prior to our perception of every event and every part of time. He, however, artificially and mechanically separated the perceptual and conceptual powers of the mind and failed to realize the full importance of all the epistemological, psychological, and ontological factors involved in time-experience, or indeed in any experience.

Kant, it must be remembered, developed his philosophy

in relation to the advance of physics in the seventeenth and eighteenth centuries. He was well aware of the conflict raging around the concepts of Absolute Space, Time, and Motion. "Before he approached the problems of space and time as a critical philosopher, he had himself lived through the various and opposite solutions by which contemporary physics sought to master these problems".¹

As early as 1756, in a youthful work, the *Monadologia Physica*, Kant attempted a reconciliation between the principles of the philosophy of Leibnitz and the physics of Newton.² Two years later he took his stand with the relativists in his *Neuen Lehrbegriff der Bewegung und der Ruhe*. He there established the principle of the relativity of all motion, in opposition to prevailing orthodox thought, but in spite of this he was unable to remain uninfluenced by the mathematical physics of his day. Hence, in 1763, in his *Versuch den Begriff der negativen Grössen in die Weltweisheit einzuführen* we find him standing with Euler in his defence of the Newtonian concepts of Absolute Time and Absolute Space. Six years later he again supported Euler in an attempted proof of Absolute Space, adding to the arguments of this thinker, which were based on mechanical principles, others adduced from pure geometry. In 1770, however, he gave his famous *Inaugural Dissertation*, which formed a turning-point in his career and laid the basis of the *Critique of Pure Reason*. He turned away altogether in this *Dissertation* from the discussion of space and time as physical concepts and removed them to the sphere of transcendental philosophy. "Tempus non est objectivum aliquid et reale . . . sed subjectiva conditio per naturam mentis humanae necessaria quaelibet sensibilia certe lege sibi co-ordinandi et intuitus purus".

In his work, *Metaphysischen Anfangsgrunden der Naturwissenschaft*, a further discussion of Absolute Space and Time shows that he takes the problem out of the field of physics. For him Time is a form of intuition, a universal form or conception, having *logical* universality, and so quite different from and exclusive of any *physical* universality or objectivity.

¹ Cassirer in "Concepts of Space and Time of the Critical Philosophy and the Theory of Relativity" in *Substance and Function*. English translation, p. 409.

² He was then thirty-two years of age.

Absolute Space and Time as entities having an existence apart from empirical bodies and empirical events Kant entirely rejects as fictitious. The true view is to regard each of them as a "schema" of connection by which what is perceived through sense data is set out in relations of co-existence (space) and of sequence (time). This means that Space and Time are "transcendentally ideal", but he follows with an affirmation that they are also "empirically real".

This phraseology has frequently proved a stumbling-block to readers of Kant. It must be carefully remembered that "empirical reality" for Kant means validity for all experience and not existence as an objective concept of experience. Kant's treatment here takes away "physical objectivity" from Space and Time. Einstein claimed later that he had in another way done the same thing. Time for Kant has no separate existence as a real object which can be perceived. In a sense it is strictly neither the objective time of the physicist nor the subjective time on which Bergson later laid such stress. It is "a rule of the understanding through which alone the existence of phenomena can receive synthetical unity". Its operations are *a priori* and valid for all time. The physicist goes from experience to idea, Kant from idea to experience. The philosopher is interested in the nature of time as at least a universal form of experience, but the physicist is concerned primarily with the problem of *measurement* of time. This distinction of interest, and consequently of method, will be referred to in connection with the development and significance of the Relativity Theory in our next chapter.¹ We are here concerned with noting Kant's early views and his ultimate parting from the world of physics for one of a transcendental kind. "Even space and time" (admits Kant), "however pure these concepts may be of all that is empirical, and however certain it is that they are represented in the mind entirely *a priori*, would lack, nevertheless, all objective validity, all sense and meaning, if we could not show the necessity of their use with reference to all objects of experience. Nay, their representation is a pure schema always referring to that reproductive imagination which calls up the objects of experience without which concepts

¹ Reference will there be made to the relation of the Theory of Relativity to Kant and his work.

would be meaningless." Ideal form as it is, Time thus conceived not only permits, but demands, an empirical union with events and things or empirical phenomena, but as a form it has no reference to any particular existence, but is logically universal in application.

In the *Critique of Pure Reason* sections of the "Transcendental Aesthetic" and the "Transcendental Dialectic" are devoted to Time and also the "Dialectic" portion of the *Third Critique* (Judgment). Kant is not always quite clear (or, indeed, consistent) in his treatment, and while much of this is in part, at least, due to his formal and rather artificial division of his subject-matter, it is also due to his special views and his inter-connection of points which are really separate. However, Kant is quite clear that time is "not something which subsists of itself".¹ It is a pure form of our sensuous intuition. It is not an empirical conception, but rather a form of "the inner sense". Time, for Kant, is a function of mental activity. In itself, independently of all mind or subject, it is nothing. His view tends to make time perceptual rather than conceptual, and several critics, notably Mackenzie, have stressed this weakness in Kant, but he explicitly states that while we cannot think of things apart from time, we can think of time apart from things. Such a conception, however, would be a pure abstraction and on a level with the notion of "empty" time whose existence Kant, while admitting that we can conceive of it, denies because he sees no meaning in it.

Time is not anything substantial; it is not concrete, but a form, a subjective condition under which all our "intuitions" (i.e. our awareness of sense data) take place. The central feature of time is "succession". In this it differs from that other form of our awareness of sense data which is space. While different spaces are co-existent and not successive, different times are successive and not co-existent. Different times, he states, are, however, merely parts of one and the same time. The feature of succession is the essential characteristic of time, which may be described as an order of such a type that its antecedent parts pass out of existence as the successive parts come into existence. Time thus lies at the root of that constant

¹ Kant, *Kritik der reinen Vernunft* (1^{te} Auf.), S. 33. English translation, Müller, p. 29.

"coming into being and passing away again" on which the Pre-Socratics, particularly Heraclitus, laid constant stress. We thus see that in spite of Kant's intensely formal treatment of this, as of other topics, he grasped the fact that time is, objectively, bound up with change and, subjectively, with our consciousness.

Aristotle had vaguely related time to number. Some similar conception appears to have been present to the mind of Kant. Students of the Critical Philosophy are well aware of the importance which Kant attached to mathematics. Concerning his exact attitude to arithmetical science there has been considerable discussion by critics in our own day and in his. This seems due mainly to conflicting statements by the philosopher himself in different works. Kant possessed, as Kemp Smith puts it, "an invincible carelessness in the exposition of his thought."¹

He appears to have argued that geometry is built upon our intuition of space and that mechanics is built upon our intuition of time. "Geometry", he says in the *Prolegomena*, "is based upon the pure intuition of space. Arithmetic produces its concepts of number through successive addition of units of time, and pure mechanics especially can produce its concepts of motion only by means of the representation of time." Again, in his *Schematism* Kant defines the schema of number in exclusive reference to time, a fact which led some of his contemporary commentators to state that arithmetic, in Kant's view, was the science of counting and therefore the science of time. He certainly perceived a connection between arithmetic and time, but he disagreed with the statement that arithmetic was the science of time. In a letter to Schultz he expressly says: "*Time, as you justly remark, has no influence upon the properties of numbers* (as pure determinations of quantity), such as it may have upon the nature of those changes (of quantity) which are possible only in connection with a specific property of inner sense and its form (time). *The science of number, notwithstanding the succession which every construction of quantity demands, is a pure intellectual synthesis which we represent to ourselves in thought.* But so far as *quanta* are to be numerically determined, they must be given to us in such a way that we

¹ Kemp Smith, *A Commentary to Kant's "Critique of Pure Reason"*, p. 124.

can apprehend their intuition in successive order, and such that their *apprehension* can be subject to time. . . ."¹ In arithmetic the quantitative relations are independent of time and are due to intellectual activity. Arithmetic is a science of concepts, and in spite of ordered sequence in its material, it is not the science of time.

It is worth noting Cassirer's remarks on this subject: "Even discounting Kant's insistence upon the conceptual character of arithmetical science, and allowing that he derives arithmetical concepts and propositions from the *pure intuition of time*, this teaching, to whatever objections it may lie open, has certainly not the merely psychological meaning which the majority of its critics have ascribed to it. If it contained only the trivial thought that the empirical act of counting requires time, it would be completely refuted by the familiar objection which Beneke has formulated: 'The fact that time elapses in the process of counting can prove nothing: for what is there over which time does not flow?' It is easily seen that Kant is only concerned with the 'Transcendental' determination of the concept of Time, according to which it appears as the type of an ordered sequence. Hamilton, who adopts Kant's doctrine, has defined algebra as 'science of pure time or *order in progression*'. That the whole content of arithmetical concepts can really be obtained from the fundamental concept of *order* in unbroken development, is completely confirmed by Russell's exposition. As against the Kantian theory it must, of course, be emphasized that it is not the *concrete* form of time intuition which constitutes the *ground* of the concept of number, but that, on the contrary, the pure logical concepts of sequence and of order are already implicitly contained and embodied in that concrete form".²

While it is true that Kant had spoken in the first edition of the *Critique of Pure Reason* of the mathematical sciences as based on the intuition of space and time, he had not (in spite of his attempt at parallel treatment of space and time) based any separate mathematical discipline on time. The references

¹ Kemp Smith, *A Commentary to Kant's "Critique of Pure Reason"*, p. 130.

² Cassirer, quoted by Kemp Smith (*Commentary*, p. 132) from *Kant und die moderne Mathematik* (*Kant Studien*, 1907). This was also discussed by Natorp in his *Die Logischen Grundlagen der exakten Wissenschaften* and by Volkelt. See the latter's *Phänomenologie und Metaphysik der Zeit*, XVI (*Zeit und Zahl*, s. 121-138).

in the *Dissertation*, the *Prolegomena*, and the *Schematism* are indirect or inconsistent, and were, as we said, refuted. In the second edition of the *Critique* no treatment of time in relation to arithmetic is given.

Kant is frequently difficult to follow in his exposition and particularly in his contention that the intuition of time is similar to that of space. He regards it as axiomatic that time has one dimension only, and that different times are not simultaneous but successive. But he has to admit that the time of the objective world exhibits simultaneities as well as succession, and he even chides Leibnitz for overlooking the importance of simultaneity. There thus appears a discrepancy. Time as the form of our inner sense shows only succession. We are not concerned at the moment with the inadequacy of this.¹ What we are concerned with noticing here is Kant's assertion that as the order of appearances, time possesses, in addition to succession, two other modes, duration and simultaneity. There are in his view two orders of time, one subjective, the other objective. But the retention of the latter is obviously impossible if time be merely, as Kant urges, the form of our inner sense. As Kemp Smith has pointed out, Kant's view of time is "the most vulnerable tenet in his whole system."² He shifts his ground continually, and by repeated contradictory statements fails to make clear to his readers his precise attitude on a number of essential points. By changing his order of exposition of space and time in the *Dissertation* (time, then space) and the *Critique* (space, then time) he fails to make it clear whether time merely *allows* representation through space or whether time *must* be represented by means of space. He equally fails to make clear whether simultaneity is a mode of time. His answers vary according to context as he is dealing with representations or with objects. The same objection and difficulty apply to his discussion of the problem whether appearances of outer sense are in time. We have noted the confusion over the relation of time to mechanics and to arithmetic. These difficulties can be traced to the fundamental dualism of the Kantian philosophy between appearance and the reality of the

¹ Mere succession is not sufficient. Time does not consist of merely discrete moments, but of the flow that binds them in continuous order.

² Kemp Smith, *Commentary*, p. 137.

thing-in-itself. Time as having one dimension, as a form of the inner sense, is intelligible but purely subjective. But motion (which is not inward) involves time. Time is contemplated as well as enjoyed, to use Alexander's phrase. Yet Kant is capable of stating that "time can no more be intuited externally than space can be intuited as something in us". The frank subjectivity and inconsistency of this statement is surprising.

Kant claims in the "Transcendental Exposition" in the *Aesthetic* that only through the intuition of time can any conception of change, and consequently of change of place (motion), be formed. This is because the idea of motion involves time. Apart from time, motion is inconceivable, contradictory, and impossible, for an object cannot both be and not be in the same place. Further, it is because the intuition of time is an *a priori* intuition that the synthetic *a priori* propositions of a general doctrine of motion are rendered possible.

His statements in the second edition imply that the doctrine of motion stands to time in a similar relation to that which geometry bears to space. One of his critics had objected with reference to the first edition that no science was based on time.¹ But a strict analogy between geometry in relation to space and mechanics in relation to time is impossible, for mechanics presupposes space equally with time. Hence mechanics cannot be a science based on time. There is the further objection that motion is empirical. Kant's assertion here (and in the *Dissertation*) of a science of mechanics as based purely on time conflicts with his better judgment previously given in his work on *Metaphysical First Principles*, in which he had affirmed explicitly that as time has only one dimension mathematics is not applicable to the phenomena of inner sense. Also, in his work, *Ueber Philosophie uberhaupt*, "time does not yield sufficient material for a whole science".

In his *Dissertation* Kant criticized Leibnitz and his disciples for their neglect of simultaneity, "the most important consequence of time".² Yet in the "Analogies of Experience" all

¹ This was Garve, according to Vaihinger (quoted by Kemp Smith, *Commentary*, p. 127).

² "Though time has only one dimension, yet the *ubiquity* of time (to employ Newton's term), through which all things sensuously thinkable are *at sometime*, adds another dimension to the quantity of actual things, in so far as they hang, as it were, upon the same point of time. For if we represent time by a straight

our experiences are successive! Verily Kant sparkles by his very inconsistencies. Time in another place in the *Critique* is spoken of as possessing duration and simultaneity; elsewhere in the same work, simultaneity, it is declared, is not a mode of time, none of whose parts can be simultaneous. The fact that all the relations of time can be expressed in an outer intuition is for Kant a proof that the representation of time is itself an intuition. Elsewhere he claimed that time could only be apprehended by means of space, which would contradict its being an intuition at all. Two periods of time cannot be simultaneous, so time has only one dimension. But existence in time manifests succession and simultaneity. This, according to Kemp Smith, arises from Kant's distinction between objects and their representation. But actually this difficulty arises more seriously because Kant *never really defined his attitude to the relation between time and events*. In spite of his transcendental departure from physics, the ghost of Newtonian Absolute Time still haunts him, and he speaks of *this* when denying simultaneity as a mode of time, but he thinks only of *events* as the constituents of time when he affirms simultaneity.¹ The doctrine of objective time developed in the *Analytic* is quite irreconcilable with the view that time is merely the form of the inner sense.

Kant's doctrine of time is highly unsatisfactory and contradictory. Kemp Smith summarizes the inconsistencies under five headings: "(1) The nature of the *a priori* knowledge which time yields. Kant ascribes to this source sometimes only the two axioms in regard to time, sometimes pure mechanics, and sometimes also arithmetic. (2) Whether time only allows of, or whether it demands representation through space. Sometimes Kant makes the one assertion, sometimes the other. (3) Whether it is possible to apprehend the co-existent without successive synthesis of its parts. This possibility is asserted in the *Aesthetic* and *Dialectic*, denied in the *Analytic*. (4) Whether simultaneity is a mode of time. (5) Whether and in what manner appearances of outer sense

line extended to infinity and simultaneous things at any point of time by lines successively erected (perpendicular), the surface thus generated will represent the *phenomenal world* both as to substance and as to accidents."

¹ This appears a more fundamental reason for these contradictions than that given by Kemp Smith whose own views on Time, given in his *Prolegomena to an Idealist Theory of Knowledge*, are discussed by us in Chap. VII.

are in time. Kant's answer to (4) and to (5) varies according as he identifies or distinguishes representations and empirical objects".¹ While this distinction is responsible for many inconsistencies in Kant on this and other matters, we think that it arises from his never having faced the issue of the relation of *time* and *events*. This is seen in his statements that time is a pure form and a manifold. If it be a pure form only, how can it be a manifold?

With regard to the continuity of time, Kant has an interesting paragraph: "Space and time are *quanta continua* because no part of them can be given, save as enclosed between limits (points or moments), and therefore as being itself a space or a time. Space therefore consists only of spaces, time only of times. Points and moments are only limits, i.e. mere positions that limit space and time. But positions always presuppose the intuitions which they limit or are intended to limit; and out of mere positions, viewed as constituents capable of being given prior to space and time, neither space nor time can be constructed. Such magnitudes may also be called *flowing*, since the synthesis of productive imagination involved in their production is a progression in time, and the continuity of time is ordinarily denoted by the expression *flowing*."²

Kant was undoubtedly influenced by the Newtonian conceptions. Originally an upholder of the Leibnitzian doctrine, his views changed under the influence of the Clarke-Leibnitz correspondence controversy, and he outlined his own doctrine in an attempt to avoid difficulties inherent in both conceptions. He was, however, largely influenced by Newton's idea of Absolute Time. Kant's great mistake, according to Bergson, was to take Time as a *homogeneous* medium. Bergson considered that there cannot in any case be *two* such media, Space and Time, but this argument misrepresents homogeneity and does not appear to be a valid criticism.

We perceive, and must perceive, ourselves and our mental states as in time. This is done by introspection. We need not, however, argue from this that we really are in time. Here comes in the Kantian distinction of noumena and phenomena,

¹ Kemp Smith, *A Commentary on Kant's "Critique of Pure Reason"*, p. 637.

² Kant, *Kritik der reinen Vernunft* (1^{te} Auf.), S. 169. English translation, Müller, p. 149.

the thing-in-itself and the thing as perceived. According to Kant we only know ourselves as we appear. But if we do not know ourselves as we really are, but simply as we appear to ourselves, we cannot then know what our forms of intuition really are, but only what they appear to be. Kant states that time is definitely a form of our sense-perception, not that it only appears to be such.

In the development of his thought Kant is led to the formulation of antinomies, and the one which affects our problem of Time may be stated:

The Time order or series presupposes either

- (1) A first member in the series of events; or
- (2) An unending extent in the antecedent members of that series.

These two suppositions are equally inconceivable, *according to Kant*. For:

(1) A first member in the series of events would have nothing before it to determine its place, and consequently would not be part of the time series. It could only be imagined as being preceded by empty time—that is, nothing.

(2) As objection to the second point, a series of events that never had a beginning would not be a series that existed at all. We may think of a series of events as going on indefinitely *in the future*, an endless series, but not as having gone on without a beginning. The beginning of the world of events is a necessary condition of its existence.

The solution Kant gives is that the infinite or infinity involved in time is not an actual or real infinite because time does not apply to things-in-themselves (but how did he know it did not?). The infinite is only another name for the power that we possess of synthesizing further and further in the construction of a temporal series. Lotze aptly pointed out that it depends, however, on the nature of things in themselves whether we shall be supplied in this way indefinitely with material to synthesize.

Infinity is not a mere synonym for endlessness. It does not mean that time has had no beginning and will have no end,

that there is no first or last term to the time-series. It is impossible to prove conclusively that time or the series of events ever had a beginning or will have an end. It is equally impossible to disprove it. This is the main point in the first Kantian antinomy, which is a valid enough antinomy although Kant's argument to disprove the endlessness of time is puerile and futile. Because definite terms exist in a series that does not necessarily imply that the series has ends.

It is sometimes argued that time cannot have had a beginning nor can the series of events in time.¹ This at least would imply the eternal reality of the will. To some temperaments this ceaseless striving would, of course, tend to make the will itself appear illusory. To others, achievement, satisfaction, and rest would alone make the will ultimately real. Others would welcome rest and repose provided it did not last too long or for ever. They would look forward to more happenings, more events, and ultimately conceive of activity in cycles of eternal recurrence—a doctrine which, although held in ancient and in modern times with enthusiasm, is akin to fatalism unless redeemed by some Platonic or Nietzschean point of view.

The acceptance of the other side of the Kantian antinomy (the view that time is limited and finite) implies an end to events and to all happenings and change. As popularly understood, and as often expressed in some religious views, this end of Time means the end of physical events, but not (necessarily) of all mental or spiritual activity. It is a moot point whether we could still call this temporal activity. In the popular view it is not, for it is eternity. Even McTaggart, who refuses to admit the reality of time, seems to echo a sentiment of this kind when he remarks that "the last enemy to be overcome is Time".

Modern philosophy has not on the whole been inclined to adopt the view of the finitude of events. The Greeks held to it along with doctrines of recurrence. In recent years the most powerful exponent of finitude was Renouvier, the great French philosopher of the latter half of the nineteenth century, who set forth a neo-critical philosophy.²

¹ Cf. Goethe's phrase: "Unendlich ist die Zeit."

² Especially shown in his *Essais de critique générale*. See Discussion in my volume, *Modern French Philosophy*.

There is a difficulty in imagining or conceiving of a first event, because we have ourselves never had experience of an event which was not preceded by some other event. The whole conception of the first event involves a transition from a perfectly static to a changing order. This is wellnigh an impossibility for the human mind to conceive. Further, a first event involves the coming into being or operation of a causal power in some manner different from the ordinary sequence of cause and effect as we understand it, commonly and in science. It may be argued, however, that our main concern is not with a first event, but with the beginning of time—that is, with the first moment. This also presents difficulties. Apart from a first event, a first moment appears quite unintelligible. Some have suggested that the first moment might precede the first event, but this surely rests on a misunderstanding. If it is said that moments preceded events, then “event” can only mean a change in the material universe. But for moments to exist there must be some *change* in some consciousness, the Divine Mind, and this surely would be an event.

The view that time might elapse before any event happened is contained in the Absolute Theory of Time, and it was mainly on this ground that Leibnitz attacked it, reviving a discussion by Augustine and, indeed, by Plato. The Absolute Theory postulated moments, but if we confine our conception of time to events the position does not arise, the difficulty fails to present itself, and we reject the idea of change being preceded by a duration of empty time. The whole notion is confused, for time is bound up with change. When change was not, no time was. Change, of course, must be taken to include any modification of consciousness in, for example, the mind of God, if He be postulated. Apart from *events* we cannot recognize time as having any meaning or existence. The series of events *may* be endless or terminated. Kant claimed an equal possibility of their being endless or terminated, infinite or finite in length. On the other hand, the events in time—or rather of time—may have had a beginning. We are in agreement with Leibnitz and Renouvier that time began with the created world. Both had a beginning, and they began together, for the one strictly involves the other.

In the first antinomy Kant offers as proof of the first

assertion, that "the World has a beginning in Time", the following argument. Let us assume the opposite: that it has no beginning in Time. The infinite is that which can never be completed by a successive synthesis, therefore the world-series can never complete itself. But the entire series of past events elapses—i.e. completes itself—at each moment. Therefore it cannot be infinite—i.e. the World has a beginning in Time.¹

There are several statements in this argument to which strong exception can be taken. The reference to successive synthesis is a merely subjective reference out of place here. More questionable, however, is the use of the verb *verfließen* in relation to the entire series of past events which is said to complete itself at each moment. This is, indeed, a quite arbitrary completion. The time-series does not *stop* at the present moment, for the present is the transitional existence which is ever coming into being and passing into the past. Kant's mind is directed to the past infinity of time because he is arguing about "a beginning", but there is no reason to limit the infinity only in this direction by the arbitrary adoption of a point "now", which cannot be completion in relation to the time-series as a whole.

The antithesis affirms (in its first part) that the World has no beginning in Time. For this the following is offered as proof. Let us assume the opposite: that the world has a beginning. It will then be preceded by empty time, in which it was not. But in any empty time no becoming is possible, since in such a time no past possesses over any other any distinguishing condition of existence rather than of non-existence. Therefore the World must be infinite as regards past time—i.e. without a beginning in Time.

Here again there are some very questionable and ambiguous statements as well as sentences quite inconsistent with other remarks by Kant elsewhere. "Empty time" is nothing, and we cannot do other than accept a beginning of events and of time as one and the same. There could be no time before events came into being. There is, however, an interesting possibility here. Might there not be events which were not events of our world at all? Kant argues as if, apart from our

¹ Kant, *Kritik der reinen Vernunft* (1^{te} Auf.), S. 427. English translation, Müller, p. 369.

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material Universe, there could be nothing but empty time, which is quite an arbitrary assumption. If, however, by "World" Kant meant every possible existence, then with its non-existence would vanish any possible causes of its existence, and the argument becomes one not about time but about cause. But Kant has assumed an attitude to this which, from any general causal point of view, is impossible, and has shown that a further impossible consequence follows. What he has really endeavoured to show is that, assuming Time to be infinite, the World may be so too. But though something did eternally exist, it does not follow that the material Universe is that something. It may well have had a beginning.

Schopenhauer regarded all Kant's theses as nonsensical, his antitheses as real arguments. Russell has discussed these arguments of Kant from his own mathematical point of view. Their objections will be touched upon in due course.¹

Kant himself thinks that there is as much difficulty in affirming that the events of the past ever had a beginning. To suppose a beginning of the series of events, he argues (not very convincingly), is to assume that at some point of time an occurrence began without any antecedent condition. This, we repeat, is a *causal*, not a *temporal* difficulty. There is nothing in time as time to say one event should occur at one time rather than earlier or later—in fact, we cannot do other than affirm that time and events are given together. The beginning of events is the beginning of time. In any case Kant's argument is hardly consistent with his affirmation that time is a mere form, but, strange as it may seem when we consider the steps of his arguments, this is what he was really intending to affirm, namely that time is not in itself a substantial thing. The issue, in short, is really this: no events, no time. The question of beginning involves not a first moment but a first event, and to ask about this is to ask how anything ever came to exist at all.²

The fundamental fact upon which, as Kant has already stated, the regulative principle of Reason is based is that it is impossible to experience an absolute limit. It is always *possible*

¹ Against the arguments of Kant in relation to the Antinomies see also Couturat, *L'Infini mathématique*, Part II, Bk. IV, Chap. IV.

² This problem occurs again in Russell's work and is referred to in our chapter on "Time and Contemporary Metaphysics".

that a still higher member of the series may be found; and that being so, it is our duty to search for it. But as we are here dealing with possibilities only, the regress is *in indefinitum*, not *in infinitum*. As he himself puts it: "We must seek the concept of the quantity of the world only according to the rule which determines the empirical regress in it. This rule says no more than that, however far we may have attained in the series of empirical conditions, we should never assume an absolute limit, but should subordinate every appearance, as conditioned, to another as its condition, and that we must then advance to this condition. This is the *regressus in indefinitum*, which, as it determines no quantity in the object, is clearly enough distinguishable from the *regressus in infinitum*."¹

We may now turn from Kant's antinomies to other sections of his work which bear on the Time-problem. Kant introduces us to his idea that the categories are inapplicable to the manifold given to us in sense perception unless they have been grasped through the medium of time. He shows this in none too clear or convincing a manner, but argues that ground-and-consequent, a category of a logical character, is applicable to the physical world when, and only when, it is transformed into the temporal form of cause-and-effect. The purely abstract categories are "schematized" by being applied to the determination of pure time. Spaces are forms or aspects of experience where the conceptions of mathematics and mechanics are the only unifying principles in knowledge.

There is here serious confusion, for Kant fails to distinguish time as percept from time as concept. He professes to acknowledge only the first, and this is difficult to reconcile with the view that sense-data are a manifold, while to regard time as in any way conceptual would have wrecked Kant's arguments and system, but might have led him to a less artificial one.

In the first argument of the first "Analogy of Experience" Kant maintains that our apprehension of the manifold is always successive and therefore always changing. "By it alone, therefore", he argues, "we can never determine whether the manifold as an object of experience is co-existent or

¹ Kant, *Kritik der reinen Vernunft* (1^{te} Auf.), S. 519-20. English translation, Müller, pp. 448-9.

successive unless there be something in it which exists always, i.e. something constant and permanent—whilst change and succession are only so many modes of time in which the permanent exists”.¹

As this argument is put forward, its first premise is false, for our sensations are not always successive. We experience simultaneity as well as succession; also we often perceive events that are really simultaneous happenings, by means of sensations which are successive. We often look upon simultaneous sensations as appearances of successive events, and we often regard successive sensations as appearances of simultaneous events. In those cases we refer to our conceptions of causality and of substance, but reference to such concepts is not sufficient, for we could not have formed the conception of a world of *co-existence* unless we had simultaneous sensations in our experience. If, as Kant suggests, all our perceptions are successive, it is impossible to see how we could ever arrive at the notion of simultaneity. He makes a bad start in these arguments, for he is quite wrong in his omission of simultaneity and his general assertion of succession.

He then puts forward a second argument, in which he asserts: “All phenomena exist in time; and in it alone, as the substratum, can *simultaneousness* as well as *succession* be represented.” This he follows by an assertion that “Time by itself cannot be perceived”. Now we have to remember that Kant was wedded to Newton’s idea of Absolute Time, and by “simultaneous events” he means two events which occupy the same moment of Absolute Time, while “successive events” occupy different moments of Absolute Time. But we cannot, as he rightly says, perceive this Absolute Time, for Time by itself is nothing, and it cannot be perceived save by means of events. What criterion have we by which to determine whether two events are successive or simultaneous, seeing that perception cannot solve the problem for us, as the order or simultaneity of our perceptions may bear no relation to the order or simultaneity of the events? Kant claims that there must “exist in objects of perception a substratum which represents Time in general and in which all change or simultaneousness can be perceived

¹ Kant, *Kritik der reinen Vernunft* (1^o Auf.), S. 182. English translation, Müller, p. 160.

through the relations of phenomena to it". We here have a re-echo of Newton's search for a perceptible uniform motion which would serve as a measure of Absolute Time. Kant obviously feels that Time, which cannot be directly perceived by us, must be represented by something permanent in the world of events or phenomena. The word permanent is, however, apt to be misleading by itself, for obviously what is wanted is some perceptible uniform motion or change which continually repeats itself. The permanence required to represent Time cannot be any unchanging permanent, but a continuous change, a uniform process. This, however, Kant does not make clear; he omits to indicate that it is this type of permanence only which can be used to represent Time, *the permanence of continuous uniform change*.

This does not mean, as Kant assumes, that there must exist some one substance which is changing. He clings to the view that there must be some one empirical substance which never began and will never cease, otherwise we cannot explain change or time, and he considers that every empirical event is a property or state of this one substance. Of course, it could be admitted that all events are states of the world, all happenings belong to or find their place in the universe, but this does not seem to be Kant's point. He thinks that the continuity of Change, and hence of Time, necessitates the persistence of some one permanent substance. This is, however, not necessary, for, as we have pointed out, what is really required to represent Time is continuous uniform change, which is not at all the same thing.¹ Kant here is too wedded to a

¹ Kemp Smith's criticism here is worth quoting in full: "The argument, in both proofs, is needlessly abstract, and, as already remarked, the reason of this abstractness is that Kant here, as in the chapter on "Schematism", unduly ignores space, limiting his analysis to inner sense. He defines the schema of substance as the permanence of the real in time, i.e. as the representation of the real which persists while all else changes. As the second edition of the *Critique* shows, Kant himself came to recognize the inadequacy of this definition, and therefore of the proof of the first "Analogy." Consciousness is only possible through the representation of objects in *space*. Only in outer sense is a permanent given in contrast to which change may be perceived. The proof ought, therefore, to have proceeded in the following manner. Time can be conceived only as a motion, and motion is perceivable only against a permanent background in space. Consciousness of time, therefore, involves consciousness of a permanent in space. He might have added that consciousness of relative time involves consciousness of change in relation to something relatively permanent, and that the scientific conception of all changes

Spinozistic view, and fails to develop even the legitimate aspects of the Bergsonian insistence on change which would have helped him to a truer view.¹

Such is Kant's second argument in his First Analogy, and in it he fails to prove his case that all perceptible events must be regarded as states of a perceptible substance or substances which neither begin nor cease in the course of nature. Events were dated, and the distinction between the subjective successions of our perceptions and the objective world of events was arrived at quite independently of a doctrine of the kind Kant here suggests. Even if we admit that the constancy of some perceived characteristic is an important factor in our dating of events, it is never the sole factor. Thus Kant's whole argument here is, like his system in general, too artificial. Sometimes one notices that he did his work in piecemeal fashion, for he here incorporates an argument whose conclusion is really inconsistent with his previous conclusion, "that all perceptions are successive". The omission of simultaneity from consideration is a serious point, for if there be no simultaneity possible, but only succession, how can his second conclusion be of any use? He has claimed that we need some representation of time by change. But if we are to date events by any such permanent change, we must be able to experience coincidences or simultaneities. If, as he affirms in his first argument, all perceptions are *successive*, we could never date other events by reference to a perceptible standard process, for this necessarily implies *simultaneity* of perception.

Kant's Second Analogy is particularly worthy of critical examination.² In it he seeks to find a way out of our difficulties about the determination of time by resorting to the principle as taking place in a single absolute time involves the determining of change through relation to something absolutely permanent, this ultimate standard being found in the heavenly bodies. By the permanent is not meant the immovable, but only that which is uniform and unchanging in its motions. The uniform motions of the heavenly bodies constitute our ultimate standard of time. The degree of their uniformity is the measure of our approximation to an absolute standard." (Kemp Smith, *A Commentary to Kant's Critique of Pure Reason*, pp. 360-1.)

¹ We say this here because of Kant's inability to realize the necessity for continuous change as distinct from a permanent substance. It must not be assumed that we adhere to the Bergsonian view of Time. This will be apparent later from our criticism of Bergson's views in Chapters VI and VII.

² Kant, *Kritik der reinen Vernunft* (1^{te} Auf.), SS. 189 ff. English translation, Müller, pp. 166 ff.

of causality, and his assertion is that "every perceptible event must be regarded as causally determined by some earlier perceptible event in accordance with some general law". He is here on very dangerous ground, for it requires only a little reflection to see that, in general, we form our conception of causal connection because of the succession of events. How, then, as Sigwart pointed out in a shrewd criticism to which we shall refer in due course, can we invoke the principle of causality in order to determine time-order when we really base our principle of causality on the sequence of events?

We shall proceed here to deal with Kant's own proofs of his assertion, and see how far he is at all successful in them before raising Sigwart's critique. The problem Kant attacks in this Second Analogy is an extremely important one, and, however unsuccessful and inadequate we may consider his treatment and solution of it to be, he deserves credit for having faced it, and especially for having formulated it.

"Having, in this general fashion, shown the bearing of his previous analysis of objective experience upon the problem in hand, Kant proceeds to develop from it his proof of the special principle of causality. The schema of causality is necessary succession in time, and it is through this, its time aspect, that Kant approaches the principle. It has to do with the special case of *change*. To be conscious of change we must be conscious of an *event*—that is, of something as happening at a particular point in time. The change, in other words, requires to be dated, and as we are not conscious of time in general, it must be dated by reference to other events, and obviously in this case in relation to the preceding events, in contrast to which it is apprehended *as change*. But according to the results of our analysis of what constitutes objective experience, it can be fixed in its position in objective time only if it be conceived as related to the preceding events according to a necessary law; and the law of necessary connection in time is the law of causality. In order, then, that something which has taken place may be apprehended as having occurred—that is, as being an objective change—it must be apprehended as necessarily following upon that which immediately precedes it in time, i.e. as causally necessary."¹

¹ Kemp Smith, *A Commentary to Kant's Critique of Pure Reason*, p. 369.

He again starts with his former erroneous assumption that all our perceptions are successive, but he recognizes the problem which faces him in the undeniable fact that we regard *some* of these as perceptions of co-existing events and *others* as perceptions of successive events. How do we, how can we possibly, make such a distinction? However true or false it be that our perceptions are successive, we certainly do make this vital distinction. Kant has no doubt about this, even although he has made the problem harder for himself by the exclusion of simultaneous perceptions. He is not, however, blind to the essential difference involved in our looking at a house and our viewing a boat gliding down a river. In these two examples Kant really states the problem at issue.

In each case our sensations are successive.¹ When we look at the house we have a succession of sensations or perceptions. We see first the roof, then the upper story, then the basement, and we observe *these in succession*, one after another. When we look at the boat the perceptions of it are again successive: one follows another. These facts are undisputed. How comes it, then, that in the first case we say we have seen co-existing parts of a single physical object, while in the second case we say we are seeing successive happenings or events and that we do not consider that we are observing successively a number of parts which are co-existent?

On Kant's own hypothesis, the observer has only his own sensations on which to base the distinction, and these sensations are *all* successive. The fact that he does make a distinction in the two cases means that he draws a distinction between the order in which he happens to get his sensations and the order which exists in perceived objects. This implies that his sensations are looked upon as signs of something other than themselves. This implication arises naturally in the circumstances and is quite independent of the Kantian doctrine of things-in-themselves, which is irrelevant here. The point at issue is the definition of our criterion of objective co-existence as distinct from objective succession.

Kant's solution is that in the case of the house the observer

¹ We need not here dispute this general statement, as it has been dealt with above and has been found erroneous. This is not, however, the point now at issue and is irrelevant to our argument.

can by experiment discover that, without doing anything to the perceived object, he could get his sensations in another (probably reverse) order, and so he affirms that the successive sensations are signs of simultaneous events or parts of an enduring object. In the case of the boat, however, this is not so, for no alteration of body or of eye is found to give the same sensations. There is a continuous change which the observer cannot overcome, and he cannot obtain, as in the case of the house, the sensations x then y in the order of y then x , try as he will (without, of course, actual interference with the course of the boat itself, which must be excluded). Hence he believes that x must objectively precede y —that is to say, he affirms these sensations to be, not signs of simultaneous events or parts of a co-existing whole, but signs of *objectively successive* events.

This solution is useful, but it will not do as it stands, for his criterion of objective sequence is inadequate. It needs to be checked by other considerations, for, if an observer stood near a gun, then whatever he did the flash would invariably precede the roar, but if he acted on Kant's criterion he would assume that the flash objectively precedes the roar, and this would be incorrect. Again, if an observer were between two guns firing successive rounds together, and he stood in such a position that the sounds were simultaneous, then if he moved in one direction—say north—he would get a different sequence from that which he would get if he moved south. Such an observer, on Kant's criterion, would arrive at a judgment about simultaneities or co-existences which would be erroneous.

Again, Kant's appeal to the principle of causality is by no means convincing. He affirms that every perceptible event must be regarded as causally determined by some earlier perceptible event in accordance with some general law. Apart from the general validity of such an appeal, even the detailed acceptance of Kant's doctrine is difficult to accept. Following on his discussion about the house and the boat, he appears to affirm now that if an observer could not have his sensations in the reverse order, then the second objective event must be causally determined by some objective event which was contemporary with the first. This, however, is untrue. Let the two events be successive sounds occurring in the same place, and suppose the second to have no cause, then the second

sensation could never precede the first under any circumstances. Mere irreversibility is no criterion of cause, but Kant affirms that the second event must have been caused by some event contemporary with the first. This he does on quite unconvincing and unreliable grounds, taking a time judgment as a basis for causal connection which, as we suggested, is an extremely dangerous and, if generalized as a principle, a false assertion.

More probably Kant meant to show that if an observer has reasons to believe that he could not have had his sensations in the reverse order, then part of his reasons must lie in a belief that the second objective event was causally determined by some other objective event contemporary with the first. Naturally we must ask: What induces an observer to believe his sensations to be irreversible? The observer may, for example, find that, however differently he adjusts his body, head, eye, or ear, he always gets the sensations in the same order. In this case the conception of cause does operate, but not so definitely as Kant claimed. What is really asserted is the irrelevancy of bodily position, not the principle that the two constants are causally connected. Usually they would be, but the establishment of causality could only be effected on other grounds, not simply on the irreversibility of sensations.

Further, if an observer has sensations sometimes in one order and sometimes reversed, and his body is in the same attitude, this in itself *proves* nothing about causal connections, although it may legitimately lead us to suspect them and to investigate in order to establish them by other inferences, but not simply by those which Kant gives. He is attempting the impossible when he seeks to relate time observances exclusively and conclusively with causal connections. The truth is that the general law on which Kant is insisting—namely, that every event is causally determined by some earlier event—is valueless for fixing the order of events. Such causal connection can only arise on other grounds, for it assumes what Kant wants to prove by it. Causality assumes that we have already objectively determined our times of events correctly, but our only empirical evidence for such causal connection lies in the observed—and repeatedly observed—sequence of events in a certain order.

This is very apparent in Kant's second argument, where he deals with imagination, in contrast to memory and perception.¹ He endeavours to strengthen his case by showing that it is useless to appeal to any moments of time, for these cannot be perceived, and that it is useless to appeal to memory, for this may mislead us with regard to order. From these two negative conclusions, he argues, we are again thrown back on causal connection. Such connection, however, is no more perceptible than moments of time, and can only be discovered by other inferences than those of time-reckoning, whether based on memory or perception (which incidentally Kant confuses in his treatment). Causality cannot be invoked to correct an imaginable reversibility, because causality implies that we have solved the problem of determining the true objective order of the events. Even if we were to assume a general principle and agree that every event has *a* cause, we cannot conclude that that cause is necessarily the particular event which we happen to observe immediately in front of it in time. This argument of Kant's is utterly unconvincing and is a futile attempt to prove the impossible, for the distinction between remembering and perceiving the order of events, and also the distinction between remembering and imagining a temporal order of events, does not, and cannot in the nature of the case, depend on the principle of causality. We may test our memory by reference to cause, but other criteria are involved in this determination. No principle of causality could be established unless we already verified our memory-judgments about events in other ways and distinguished them from imaginations in ways quite different from those which Kant plausibly puts forward.²

Equally unconvincing is Kant's final argument, which amounts to saying that *logically* we can reverse any pair of events, but we hold none the less that there is an inevitability about their order, for we are convinced that no pair of moments could stand in any other relation to each other than that in which they do, in fact, stand. But if moments are imperceptible,

¹ Kant, *Kritik der reinen Vernunft* (1^{te} Auf.), S. 201, English translation, Müller, p. 176.

² We may note here that Kant fails to distinguish between "perceiving a change" and "perceiving that a change has happened". Cf. Bergson's Oxford Lectures, *La Perception du Changement*, where, as in Stout, the psychological distinction is carefully noted.

how can we affirm this? Kant says we affirm this of moments because of what we know of events, namely, that they are each causally determined by an earlier event. If all events are so determined, then it is impossible that any totality of events should or could be different from what they actually are. Only by recognition of the causal connection of perceptible events do we know the logical necessity of the order of moments, which are imperceptible apart from events.

This assertion, however, does not *prove* any principle of causality; it only asserts our belief in it, which is quite another matter. Further, the relation of moments and events need involve no appeal to causality and is only confused by such an appeal. Moments have by definition only the character of temporal position, but events are concrete qualitative happenings. To speak of altering the temporal position of any moment is absurd and self-contradictory, for it is to make it a different moment.

Here again is manifested the futility of Kant's attempts to base arguments about time on causality, a proceeding which, as we have seen, fails in itself in detail, and, as we shall see shortly, brought on him the criticism of Sigwart, who rightly recognized the impossibility of such arguments on the ground that any principle of causality assumes that we have *already* determined satisfactorily the objective *order* of events.

It is particularly unfortunate that Kant considered that our perceptions are only successive. More serious still is the manner in which he speaks of all objective sequence as causal, a point which he cannot, and does not, consistently maintain when he treats of causality in particular rather than time. These difficulties were seized upon by Schopenhauer, who had little trouble in showing that one event may succeed another without being caused by it. Kant's own examples of objective succession are not examples of cause and effect. The cause of water turning into ice is not the water; the cause of the ship going farther down the stream is not the fact that the ship was in a position previously higher up the river. If this were so, then, as Schopenhauer argued, "night must cause day; and if I come out of a house and a tile immediately afterwards falls from the roof and strikes me on the head, my coming out of the house

must cause the falling of the tile—which is absurd”. The truth is that in his discussion of time and causality Kant appears to have forgotten other statements made by him about the latter and to have been led into gross inconsistency. In other places he clearly meant to show not that if B succeeds A it must be causally determined by A, but that the sequence AB must necessarily be determined by some cause or causes—that is to say, that any given event is causally determined by some “as yet indeterminate correlate”. This is a very different matter from the assertion that all objective sequence is causal in the sense that A is the cause of B, and is quite inconsistent with it. His discussion is most unfortunately worded, for Kant cannot have meant to uphold a doctrine so contrary to fact and, moreover, so obviously inconsistent with his repeated assertions that particular causal laws can only be discovered by induction from particular experiences. The outcome of all this is that Kant’s laboured attempts to relate time and cause break down altogether because of inadequacies, errors inherent in his arguments, and because of inconsistency with sounder parts of his work.¹

Kant connects the three “Analogies of Experience” on Substance, Causality and Reciprocity with the fact that time has three modes: duration, sequence, and co-existence. This might erroneously imply that these are separate aspects of time. All three involve one another. We are only aware of duration in contrast to succession, of succession in contrast to duration, and both involve consciousness of co-existence.

His recognition of simultaneity is also bound up with his view that consciousness of time as a whole preconditions consciousness of its parts. Against this stands his doctrine that consciousness of time is only possible through successive combination of its parts. This opposing doctrine implies that simultaneity is not a mode of time and that it is only possible to apprehend time by synthesis by means of the categories. These give objectivity and hence bring out the distinction between the successive elements of mental time and the objective elements of the outer world, which may be successive (like the positions of a boat) or permanent (like the house).

¹ There is an interesting discussion of this point in Ewing’s volume, *Kant’s Treatment of Causality*.

Kant claims that time itself cannot change, but this is spatialization of time, against which Bergson spoke.¹ Although events are ranged or given and dated in a single time, it is not an unchanging time. This is indeed the ghost of Space (or of Newton's *Tempus absolutum verum mathematicum*) haunting and obsessing the reflective Kantian consciousness.

Schopenhauer entirely misses the point of Kant's argument and side-tracks it by references to subjectivity, which are unfortunate consequences of Kant's own phraseology, but are irrelevant to his main point in this argument, which is to the effect that consciousness of a time-order, even though subjective, must ultimately involve the application of some objective standard. Out of a consciousness of the purely subjective the notion of the objective cannot arise. We do distinguish the subjective order of our perceptions from the order of the events of which they are perceptions, and this order is objective. Kant's further contention is a consequence of this, namely, that the principle of causality is presupposed in all consciousness of time. In order to grasp objective change the event must be apprehended as necessarily following upon what immediately precedes it in time. The succession itself need not be causal, but it must be regarded as rendered necessary by connections that are causal. He does not argue that irreversibility is by itself a proof of causal relation, but only that the consciousness of such irreversibility demands the concept of causality (Second Analogy). In the Third Analogy he argues, not that the consciousness of co-existence implies reversibility, but that only through the idea of reciprocity can the reversibility be properly grasped. Night and day, in so far as they are sequent events, must be conceived in terms of causality, not in the sense that night causes day, but as being determined by causes that account not only for each separately, but also for the sequence. As Caird puts it: "Kant has shown, not that objective succession is always causal, but that the determination of a succession of perceptions as referring to

¹ Bergson, *Les données immédiates de la conscience* (*Time and Free Will*). This is the contradictory idea of succession in simultaneity, based on "the mixed idea of a measurable time, which is space in so far as it is homogeneity and duration in so far as it is succession, the ghost of space haunting or obsessing the reflective consciousness."

a succession of states in an object involves the principle of causality.”¹

Summing up Kant's views on Time, we may note that his main insistence is that time is not in itself an entity at all. He objected to the views of both Newton and Leibnitz. He refused to believe that space or time was anything absolute or an entity having any separate existence. Apart from things or events, space and time would be nothing. But they are not nothing. On the other hand, as things are in space and time, then space and time are not themselves things, nor are they merely relations. The perception of space and time is implied in each and every perception of things. We do not derive them from our study of things; they are given from the beginning with the perception of things. They are not abstractions derived from particulars, as whiteness is derived from white things. Kant claims in opposition to Leibnitz that space and time are not in the ordinary sense concepts because they have no instances. Particular men are *instances* of the concept Man, but particular times are *parts* of one Time. Leibnitz was wrong, Kant affirms, in considering that space and time were only relations. They have an independence of things in the sense that qualitative differences in things do not affect the nature of space and time, and we may examine this nature independently of the quality of things. But although space and time may be abstracted from things in space and time, they do not exist independently of things.

Kant affirms that space and time are *a priori* forms of our perception. By form he means “that which causes that the manifold of the phenomena is perceived as arranged in specific relations”. This form is something given, not subjective, and certainly not of the same type as colours. Compared with colours, space and time are objective. All that Kant here implies is that in all perception we find space-and-time order or distinction. Yet in spite of the relative objectivity here asserted, Kant claims that space and time are, after all, only and merely forms of our perception, in the sense that they are the subjective framework into which we arrange our experience;

¹ Caird, *Critical Philosophy of Kant*, Vol. I, p. 572.

and this leads us to suppose or imagine Absolute Space and Absolute Time, which we do not even actually perceive, and which we imagine or conceive as infinitely extended and infinitely divisible. But such infinite and absolute Time is only the subjective form of our ordering of our perceptions. Time is not an illusion, but a constant element of our perceptions. It is only an illusion if we imagine it as existing independently of what we perceive, for it has meaning only in connecting our experiences and giving a form to what we have perceived, now perceive, and may yet perceive. In the last resort, then, time is for Kant subjective.

Kant's assertions in his Antinomy are intended to convey to us his opinion that the spatio-temporal system cannot be thought of as either finite or infinite, and that anything which exists in that system cannot be considered as either infinitely divisible or as consisting of ultimate indivisible parts.

From a formal point of view and from a general *conceptual* standpoint as well as that of mathematics, time must be admitted to be infinitely divisible as well as space. This was Zeno's problem in the Puzzles of the "Flying Arrow" and "Achilles and the Tortoise". The difficulty arises partly from the erroneous supposition that a continuous movement which can be infinitely subdivided is never completed. But once we begin on this artificial division we must remember that with every infinitesimal portion of space involved in the movement an infinitesimal portion of time is also involved. Formally and conceptually there is no difficulty, as all we mean is that no limit can be set to such division from this point of view. Perceptually, of course, time may reach a fraction which for us cannot be further subdivided. Russell's arguments, referred to in a subsequent chapter, touch on this point, but the paradox arises from overlooking the essential *actual continuity* of the movement and of space and time.

Kant argues that, if we assume that there has been an infinite extent of time in the past, then we must take this as implying that an infinite series has been completed, which is contradictory and inconceivable. There is not a difficulty for thought in conceiving that a process once begun is going on indefinitely. It is conceivable that a process may never end.

What is not conceivable is that a process now going on never began. A future infinity means that the series of events will never end, but a past infinity means that an infinite series has been completed, which is a contradiction. Kant claims, however, that it is just as difficult to suppose that the series of events ever began. His difficulty here seems to lie in his forgetting his own argument about empty time and that there could not be time prior to the first event (as Plato and Augustine had also claimed). The difficulty lies not in the nature of time as such, but in the conception of cause in relation to a first event. If time is given with events there can be no time before the first event. The beginning of events is the beginning of time.

Behind all this lies Kant's attempt to show that time is not an entity in itself. Time is *empirically real* as a condition of all experience, but not absolutely real, for time does not belong to objects as they are in-themselves, but only to the subject that perceives them. It is *transcendentally ideal*, for in abstraction from the subjective conditions of perception time is simply nothing and cannot be said to subsist by itself or to inhere in things that do so subsist.

Kant maintains that space and time are not conceptions but intuitions. "Time", he writes, "is not a discursive or, as we say, general conception, but is a pure form of sense intuition. Different times are but parts of one and the same Time. But a single representation, which can only be given through a single object, is an intuition, not a concept." Time is for him not a mere name for the totality of all individual times in the way that man is a name for all individual men. It includes them as "man" does not include individual men.

It must be pointed out that we do not, and cannot, intuit all Time. The perception of all Time is neither necessary, nor indeed possible, for the awareness of time. This fundamental awareness is always awareness of an amount, but never the whole of Time. Time is more than the duration presented to us as intuited in consciousness, i.e. Time is more than the present. Time in general must therefore be a concept, or if we cavil at this word because of what Kant says about "man", then an *Idea*, but not a mere percept.

We certainly are not directly aware of time as infinitely

divisible. Such a statement shows Kant's failure to distinguish perceptual and conceptual time. For him time is only a mode of our experience. It is not ultimately real, and cannot be affirmed of the real or noumenal world, which exists eternally, independent of the conditions of temporality. Such an eternity of existence is, however, not to be penetrated by the powers of "pure" human reason and is beyond our knowledge. Time, he considers, must as a form or notion logically precede our perception of events and of every part of time. Kant, however, artificially and mechanically separated the perceptual and conceptual powers of the mind and failed to realize the full importance of all the factors involved in the discussion of time.

There is grave contradiction in his views of both space and time. In his view of space as a form, not of things but merely mental representations, Kant implies that time is a real form and an actual characteristic of those representations in themselves and not merely of our perception of them. His own proof that space is phenomenal implies the reality of time. Further, he is obliged to recognize two orders of succession, the purely subjective and the objective, but he avoids the implications of two classes of succession in time. Prichard has stated the matter concisely when he says: "Kant must at least concede that *we* undergo a succession of changing states even if he holds that *things*, being independent of the mind, cannot be shown to undergo such a succession; consequently he ought to allow that time is not a way in which we apprehend ourselves, but a real feature of our real states".¹

Time, according to Kant, is not presented to us as a quality of the external world. It is "nothing else but the form of the inner sense—that is, of the perception of ourselves and of our inner state. For time can be no determination peculiar to external phenomena."² This frank statement of subjectivity is further endorsed by him: "If we abstract from the manner in which we immediately perceive our own inner state and mediately all external phenomena and think of objects

¹ Prichard, *Kant's Theory of Knowledge*, Chap. V, "Time and Inner Sense", p. 114. See also Cook Wilson's published papers, *Statement and Inference*.

² Kant, *Kritik der reinen Vernunft* (1^{te} Auf.), S. 33. English translation, Müller, p. 29.

in themselves, we find that in relation to them time is nothing at all."¹ Time is therefore a purely subjective condition of human perception, and in itself, or apart from the subject, it is nothing at all.² There can be no doubt of Kant's position on this point.³ For him time is a conception of our minds, not derived or built up in any way from experience, but applied *a priori* to all experience as a pure form of external phenomena and the *a priori* condition of all phenomena.

Kant's whole treatment of the subject, while stimulating, is inconsistent in several respects and is misleading by its subjectivity. His own dualism is partly responsible for this as well as the curious way in which his doctrines are built up. He claims that we do not know what things are in themselves, yet he has to admit the existence of a world of events which perception does not alter, but which is *given* to us as the data of experience. He claims, on the one hand, that time is known to us with phenomena, but not without them; on the other hand, he states that time we know by an inner sense; it is a pure form of our intuitions. If, however, it be in his sense of the word an "intuition", it cannot be merely subjective. The doctrine of time as an intuition is clearly opposed to the view that it depends on an inner sense. We cannot at the same time regard it as an inner sense and claim that it is an *a priori* condition of all our knowledge. Our awareness of time grows by experience; it is not psychologically *a priori*. If we admit that epistemologically it has an *a priori* significance although not psychologically *a priori*, it is so because we experience it as a fundamental element *objectively* given in the world of that experience, not because it is an inner sense or form of our minds.⁴

In the *Dissertation* Kant put his view: "Succession does not generate the conception of Time but stimulates us to form it."

¹ Kant, *Critique of Pure Reason* (Transcendental Aesthetic 2).

² May Sinclair, *Uncanny Stories*. The last tale, "The Finding of the Absolute", gives an amusing and clever interview with Kant in heaven on Space, Time, Einstein, and the description of three-dimensional time, past, present, and future. Pp. 225-47, especially pp. 244-6.

³ He indeed says: "All phenomena may vanish, but time itself cannot be done away with." But this is not Newtonianism, for he deliberately inserts as a qualification the statement that time is only "*the general condition of their possibility*". It is no substantial entity. (*Kritik der reinen Vernunft* (1^{te} Auf.), S. 31. English translation, Müller, p. 27.)

⁴ For Kemp Smith's own views see his *Prolegomena to an Idealist Theory of Knowledge*.

The before-and-after relation can only be known (he held) if we know time.

Kant had indeed not liberated himself from the mediaeval view of Time. He did not appreciate sufficiently the significance of the realism and objectivity of Galileo or of Newton's view of time, although he was acquainted with it (and was a diligent student of Newton). In spite of their objective treatment of it, he remained in a subjective position—a position which, looking on time as a mere form, did not give it even the psychological importance which another subjectivist, Bergson, was willing to confer upon it. His treatment of time in reference to causality is generally untenable throughout and drew on him the righteous criticisms of Sigwart, who, not wedded to the Newtonian conceptions, saw the difficulties both in relating time to cause and in attempting to measure time. Sigwart, Mach, and Poincaré led up to Einstein and the anti-Newtonian conceptions of the present day.

Kant's chief merit was not in his attempted solutions of the Time problems, but in his *statement* of the problems. Locke had raised the distinction of objective and subjective time; Kant did not work out these distinctions as he might have done, but remained in the subjective position. He did, however, appreciate the difficulty involved in the distinction between the subjective time-order in which we perceive events and the objective order of those events of which they are the perceptions.

Cassirer raises the interesting question as to how far the doctrines of Kant are "entangled in the fate of the Newtonian physics", in which Kant had such confidence and whose philosophical systematizer he appeared to be.¹ This point will be raised after we have examined Relativity. Our own view here is that Kant's system is entangled not so much in the fate of the Newtonian or any other physics as in its own inherent difficulties, which arise from the artificial divisions of so much of Kant's own thought. After all, Kant's aim was not dogmatism or fixity of truth, but the continuous development of a science. He will remain the central figure of modern

¹ Cassirer on "The Concepts of Space and Time of Critical Idealism and the Theory of Relativity" in Chap. V of his Supplement on Einstein in his work, *Substance and Function and Einstein's Theory of Relativity*.

philosophy, not because of what he offered in the way of solutions, but because of the way in which he enunciated the problems at issue in the different fields of inquiry, and this is particularly true of his treatment of Time.

II

The immediate successors of Kant were placed in the position in which every great mind places those who come immediately after him—the position of having to explain him. This, as we have seen, could be no easy task, and there were some who considered Kant's main aim to be one thing, while others insisted that it was another. Even when he drew upon himself criticism, his statement of problems remained the dominating feature of subsequent thought not only in Germany but in France and Great Britain. In addition to the criticisms of Trendelenburg and Ueberweg (the more powerful thinkers of the nineteenth century), all had something to say about his attitude to the Time-problem. Their statements, however, were very far from being of equal value, and some of the attempts to elucidate Kant only misrepresented him. Criticisms like those of Schopenhauer and Spencer rested on a misunderstanding of his work. For Hegel, with his Absolute Idealism, Time was not ultimate, but Lotze endeavoured to present a more realistic position although still adhering to idealism in the end. Renouvier (who has never received the attention he deserves) evolved his neo-criticism as a restatement of much in Kant with quite definite differences, which are apparent in his attitude to the problems of the antinomies. Shadworth Hodgson, with his empiricism, endeavoured, especially in his earlier work, to cling to Kant, in spite of his own narrow perceptual foothold. This foothold was precarious and slippery, and he was never sufficiently on the Kantian level even to get a real grip on one blade of the grass growing in the Kantian meadow. Hence it could not sustain him, and, his foothold giving way, his ambitions of scaling the cliff of reality were shattered and he fell backwards, turning so many somersaults in his descent that quite naturally he took a topsy-turvy view of percept and concept, arriving at the foot of the cliff so

giddy that he could not tell the difference between them. Sigwart's criticisms and his remarks on the "Analogies of Experience" lead naturally from Kant to the doctrines of Relativity, whose relation to the Kantian philosophy involves an interesting discussion by Cassirer and others given in our next chapter. Meanwhile we may note that the main trend of the discussion in Kant's successors centred around the distinctions of (1) Time as percept and as concept, and (2) Time as subjective and as objective. We shall now pass to an examination of their respective arguments and views in detail.

Schopenhauer, in his *World as Will and Idea*, set out twenty-eight propositions or *praedicabilia* concerning Time:

1. There is only *one* Time, and all different times are parts of it.
2. Different times are not simultaneous but successive.
3. Time cannot be thought away, but everything can be thought away from it.
4. Time has three divisions: the past, the present, and the future, which constitute two directions and a centre of difference.
5. Time is infinitely divisible.
6. Time is homogeneous and a *Continuum*, i.e. no one of its parts is different from the rest nor separated from it by anything that is not time.
7. Time has no beginning and no end, but all beginning and end is in it.
8. By reason of time we count.
9. Rhythm is only in time.
10. We know the laws of time *a priori*.
11. Time can be perceived *a priori*, although only in the form of a line.
12. Time has no permanence, but passes away as soon as it is there.
13. Time never rests.
14. Everything that exists in time has duration.

15. Time has no duration, but all duration is in it, and is the persistence of what is permanent in contrast with its restless course.

16. All motion is only possible in time.

17. Velocity is, in equal spaces, in inverse proportion to the time.

18. Time is not measurable directly through itself, but only indirectly through motion, which is in space and time together; thus the motion of the sun and of the clock measure time.

19. Time is omnipresent. Every part of time is everywhere, i.e. in all space at once.

20. In time taken by itself everything would be in succession.

21. Time makes the change of accidents possible.

22. Every part of time contains all parts of matter.

23. Time is the *principium individuationis*.

24. The "now" has no duration.

25. Time in itself is empty and without properties.

26. Every moment is conditioned by the preceding moment, and is only because the latter has ceased to be. (Principle of sufficient reason of existence in time.)

27. Time makes arithmetic possible.

28. The simple element in arithmetic is unity.

Schopenhauer agrees with Kant that time is an essential form of all experience, and calls it "the first and most essential form of all knowledge or the form of the inner sense".¹ He commends Kant for placing his investigations of time and space at the forefront of his work, for "to the speculative mind these questions present themselves before all others: What is time? What is this that consists of mere movement without anything that moves it?"² He himself regards time as entirely dependent on the subject, and cites as "a sufficient proof" of this the fact that it is impossible for the mind to think away time, but it can think away things in time. As geometry rests on the pure intuition or perception of space, so counting rests on the perception of time. "All counting", he argues, "consists in the repeated affirmation of unity. Only for the purpose of

¹ Schopenhauer, *The World as Will and Idea* (English translation, Haldane and Kemp), Vol. III, p. 12.

² *Ibid.*, Vol. II, p. 202.

always knowing how often we have already affirmed unity do we mark it each time with another word: these are the numerals. Now, repetition is only possible through succession. But succession—that is, being after one another—depends directly upon the intuition or perception of *time*. It is a conception which can only be understood by means of this; and thus counting also is only possible by means of time.”¹ He refers to Aristotle’s view of time as “the number of motion”, and his doctrine that if the soul were not, time itself could not be. “If arithmetic had not this pure intuition or perception of time at its foundation it would be no science *a priori*, and therefore its propositions would not have infallible certainty.”² “In time”, says Schopenhauer, “every moment is conditioned by the preceding. The ground of existence, as law of sequence, is thus simple, because time has only one dimension, and no manifoldness of relations can be possible in it. Every moment is conditioned by the preceding; only through the latter can we attain to the former; only because the latter was, and has elapsed, does the former now exist. All counting rests upon this nexus of the parts of time; its words merely serve to mark the single steps of the succession. This is true of the whole of arithmetic, which throughout teaches nothing but the methodical abbreviations of counting. Every number presupposes the preceding numbers as grounds of its existence; I can only reach them through all the preceding, and only by this means do I know that, where ten are, there are also eight, six, four.”³

In a scathing and virulent footnote he attacks Rosenkranz for saying that “it is incorrect to conceive arithmetic as the science of time, really for no other reason than to give a pendant [*sic*] to geometry as the science of space”.⁴

Schopenhauer took Kant to task for his arguments about time in relation to causality as contained in the Second

¹ Schopenhauer, *The World as Will and Idea* (English translation, Haldane and Kemp), Vol. II, pp. 204-5.

² *Ibid.*, Vol. II, p. 205.

³ *Id.*, *Werke* (1873), Bd. I, S. 133; quoted by Kemp Smith, *Commentary to Kant's Critique of Pure Reason*, p. 130.

⁴ Rosenkranz in *Deutschen Museum*, 1857. No. 20. For Schopenhauer’s criticism see *The World as Will and Idea* (English translation, Haldane and Kemp), Vol. II, p. 204.

Analogy.¹ He urges that there is no essential difference in Kant's examples of our perceiving a house and a moving boat. Kant had asserted that in the case of the house our perceptions could follow any order, top or bottom first, but in the case of the boat we were obliged to see the ship at a point higher up the river before we saw it in a position lower down the river. To this Schopenhauer objected that in both cases the change in our perceptions is necessarily determined by the movement of a body. In the case of the house it is our eyes that move relatively to the surrounding objects, while in the other case it is the ship. Against Kant he claims that the one succession is as objective as the other. This claim, however, we must reject as invalid. In looking at the house, we are concerned with the perception of that house and its parts, not with the perception of the movements of our own body and its parts. If we were observing our body, we should assign objectivity to its movements, but in observing the house the movement of our body is subjective in reference to or contrast to the object we are perceiving. In so far as our perceptions result from such subjective movements, they are referred to our body and not to the house. We do not assign objectivity to the order in which we perceive the different parts of the house because we do not regard this order as determined by factors external to our body. Schopenhauer cannot overthrow the soundness of Kant's distinction, which is based on the fact that we do distinguish the subjective order of our perceptions from the objective order of the events of which they are perceptions.

With regard to Schopenhauer's next criticism, we have already pointed out the inconsistency in Kant's own treatment of objective sequence. He does assert that all objective sequence is causal, but in other places his views differ, and themselves agree with Schopenhauer's objection that night does not cause day, and that an exit from a house is not the cause of the tile falling on one's head. This and other objections made by Schopenhauer can be met by other statements in Kant's work, as we have already indicated above. The view that all objective sequence is causal in the sense that B is always directly caused by A, which precedes it, is untenable and inconsistent not only with facts, but also with Kant's repeated assertions that

¹ In his work *Ueber die vierfache Wurzel des Satzes vom zureichenden Grunde*.

particular causal laws can only be discovered by induction from particular experiences. In other words, if B succeeds A, it is not causally determined by A, but rather the sequence A-B is necessarily determined by some cause or causes, so that any given event is causally determined by some "as yet indeterminate correlate". Schopenhauer's objection to the Second Analogy is to the effect that Kant's admission that we can only discover particular causal laws by experience of objective succession is inconsistent with the view that we only recognize a succession as objective by discovering the causal laws which determined it. Kant elsewhere saw and admitted this, but his statements in the Second Analogy are indeed unfortunate and must be taken as inconsistent with emphatic statements elsewhere. This is a difficulty well known to students of Kant's work as a whole.

We have in our previous section shown the real significance of Kant's arguments in this connection and noted that Schopenhauer's objections rest on a misunderstanding. Here we may quote two direct replies to Schopenhauer on these points made by Stadler in his *Grundsätze der reinen Erkenntniss-Theorie*, as quoted and translated by Caird. "When Schopenhauer adduces the sequence of musical notes or of day and night, as objective sequences which can be known without the causal law, we need only meet him with the question: Where in these cases is the substance that changes? So soon as he is forced to put his objection into the form required to bring it into relation to the question of the possibility of knowledge, his error becomes obvious. His instances must then be expressed thus: The instrument passes from one state of sound into another; the earth changes from the measure of enlightenment which makes day to that which makes night. Of such changes no one will say that they are not referred to a cause. And we may quote in this reference the appropriate saying of Kant himself: 'Days are, as it were, the children of Time, since the following day, with that which it contains, is the product of the previous day.'"

"Schopenhauer points out that what we call chance is just a sequence of events which do not stand in causal connection. 'I come out of the house and a tile falls from the roof, which strikes me; in such a case there is no causal connection between the falling of the tile and my coming out of the house, yet the

succession of these two events is objectively determined in my apprehension of them.' How have we to criticize this case from the transcendental point of view? We know that successions become necessary—i.e. objective—for our consciousness, when we regard them as changes of a substance which are determined by a cause. But it is shown here that there are successions in which the single members are changes of different substances. If substance *S* changes its state *A* into *B* on account of the cause *X*, and substance *S'* changes its state *A'* into *B'* on account of the cause *X'*, and if I call the first change *V* and the second *V'*, the question arises how the objectivity of the succession *VV'* is related to the law of causality. Sequences such as *VV'* are very frequent, and our consciousness of the objectivity is certain. Do we owe this consciousness to the same rule as holds good in other cases? Certainly. The distinction is not qualitative, but rests only on the greater complication of the change in question. The sequence *VV'* can become objective only if I think it as a necessary connection. It must be so determined that *V'* can only follow *V* in 'consciousness in general'; there must be a *U*, the introduction of which is the cause that *V'* follows *V*. To be convinced of this, I do not need actually to know *U*. I know that on every occasion *U* causes the succession *VV'*. Of course, this presupposes that all data of the states considered, *A* and *A'*, remain identical. But whether these data are very simple or endlessly complex, whether they are likely to combine to the given result frequently or seldom, is indifferent for the objectifying of the event; it is not the perception of *U*, but the presupposition of it, which makes the change necessary and so objective for us."¹

Early in his *magnum opus* Schopenhauer remarks with sublime assurance that "whoever has recognized the form of the principle of sufficient reason, which appears in pure time as such and on which all counting and arithmetical calculation rests, *has completely mastered the nature of time*. Time is nothing more than that form of the principle of sufficient reason and has no further significance. Succession is the form of the principle of sufficient reason in time and succession is the whole

¹ Stadler, *Grundsätze der reinen Erkenntniss-Theorie*, S. 151; quoted by Caird, *The Critical Philosophy of Kant*, Vol. I, p. 572.

nature of time".¹ For Schopenhauer time is primarily the form of the inner sense, a form of the self-knowledge of the will, the means by which the will appears drawn out into a course of life. Yet he affirms that it presents itself as "*independent of the subject and completely objective*". It is independent of our will and our knowledge of it. But it is not identical with objective motions, such as the planetary motions, for these only serve to measure it. "It exists only in the heads of percipient beings, but the uniformity of its course and its independence of the will give it the authority of objectivity."² This is indeed strange and inconsistent language. If it be objective, how can it be a form of the inner sense or of the will?

Trendelenburg regarded motion as the basis of our percepts and our concepts. The notion of time is, he claimed, not *a priori*, but is derived from motion. This was one of his principal criticisms of Kant in his *Logische Untersuchungen*.³

Herbart looked on time as the number of change and as a purely objective appearance, in spite of his psychological interests. This writer's main work was to give a new impetus to the study of psychology. He prompted indirectly some of the experimental and quantitative researches into the characteristics of perception. It was in Germany, in spite of Lotze's pessimistic declaration, that the experimental researches into the perception of time were mainly conducted, in accordance with the principles of Fechner and Wundt. The most prominent researches into time-measurement were those carried out by Meumann.⁴

The subjectivist conception of time contained in Kant was developed by Teichmüller. He described time as a perspective-order given to objects by a timeless self. Duration, on this view, is a mere immanent measuring of this perspective order. The concept of time has, however, nothing of magnitude in it; it is merely a perspective. The objective order of events is a perspective order, produced by scientific work and based on

¹ Schopenhauer, *The World as Will and Idea* (English translation, Haldane and Kemp), Vol. I, p. 9 (*italics mine*).

² *Ibid.*, Vol. II, p. 205.

³ Trendelenburg, *Logische Untersuchungen*, Bd. I, Kap. V-VIII.

⁴ Meumann, "Beiträge zur Psychologie des Zeitsinns" in *Philosophische Studien*, 1893, 1894, 1896.

comparative investigations of subjective and simultaneous or successive experiences in conscious minds. This is the historical, actual order of events, and this order is timeless. All time and duration are relative and depend on perspective. For an absolute consciousness the whole world of events may be simultaneous. To urge, however, that time is merely a perspective order is to deny the reality of change and arises from the subjectivist point of view, which marred the treatment of Kant and was to be, later, still further exaggerated in Bergson.

III

In the Hegelian philosophy a newer and more concrete recognition of Time appears in a sense wider than that manifested by Kant. Opposing the mere identity school of thought of which Schelling was head, Hegel was impressed with the significance of history and the concreteness and richness of the time-process of events. While not despising the logical method and the preoccupation with concepts drawn from logic and the physical sciences, Hegel added the time-perspective as a real feature of the universe, as seen in Evolution, of which he vaguely conceived, and in History, which he raised to a new dignity and to a closer relationship with Philosophy. It is true that he strains overmuch in his attempt to make phases of history illustrate his conception of the unrolling in time of the Absolute Idea. This Absolute Spirit is conceived of by him as both *in* time and *out* of time and as evolving slowly in time. In his *History of Philosophy* he remarks: "As to the slowness of this world spirit in achieving for itself a philosophy, a thousand years are before it as one day; it has time enough precisely because it is out of time, because eternal." Philosophy is concerned with the recognition, within the appearances of the temporal and transitory, of the substantial and the Eternal, there immanent and present. He does not explicitly deal with the relation, so important for an Absolutist philosophy, between the Eternal Idea and its manifestation in Time. There is, however, in his whole thought a grasp of the importance of History and of the presence of an almost Christian renunciation or self-limitation throughout this process, together with a belief

in a dominant Reality within the duration of this process, giving to it its worth and Eternal meaning. For Hegel the temporal order of events is real, but its apparent transience is not ultimately real. The events of Time are the alphabet and the words of an Eternal language.

The Dialectic of Hegel is a Dialectic of Thought and Idea, and as such it is timeless and abstract. For the neo-idealists of to-day, who owe much to Hegel,¹ the Dialectic is one of History, and as such it is temporal and concrete. In the Dialectic of Thought the Absolute Idea in its repose is timeless. In the Dialectic of History, however, the Idea as concrete appears not as static or in repose, but as dynamically working and progressing in time. Of those Dialectics the fundamental is the Dialectic of History; all other Dialectics depend on it.²

The mediaeval attitude of indifference to time, and the keen interest in the events of the time-process which marks the temper of the social reformer, were seen in Hegel's more youthful writings and passionate utterances. The paradoxical dualism of Christianity is again apparent, with its insistence on the one hand upon peace, consolation, and comfort, which obsession with the world of time cannot apparently give and which makes the events of time themselves irrelevant, and on the other hand upon social activity for the Kingdom of God on earth. Hegel's young mind blended the two influences, but in the end the former feeling seems to have predominated, and in a mood of indifference to time he could declare: "Der Weltgeist hat Zeit genög."

We must, therefore, in the end rank Hegel with Parmenides, Plato, Plotinus, Aquinas, and Spinoza as one for whom, as for the mediaevals, Time was irrelevant and inapplicable to that Whole which is ultimate Reality.

The purely Hegelian attitude to Time involves a certain loss of content by relegating reality to logical categories. Hegel regards Eternity as absolute timelessness. In an interesting note on "The Temporal and the Eternal" in his *Realm of Ends* Ward regards it as "an admission of the futility of all attempts

¹ See Croce, *Saggio sullo Hegel*, a volume containing, in addition to an Essay on Hegel, essays on the Philosophy of History, a subject in which Hegel was vitally interested, as his work shows. The Essay on Hegel has appeared in English under the striking title, *What is Living and what is Dead in the Philosophy of Hegel*.

² See Hegel's own remark, *Geschichte der Philosophie*, I. 46.

by reference to Time to determine what is here meant, for a negative definition as such is plainly no definition. But since we know nothing but the truths of reason which we can speak of as absolutely timeless, we should be led at once to suppose that this, the Spinozistic meaning of the eternal, was Hegel's meaning, too." "And", adds Ward, "it was."¹

Hegel's philosophy, like that of other great masters, has suffered from misinterpretation, narrow interpretation, and dispute. It should not be forgotten, however, that in some respects Hegel stands nearer to the Bergsonian philosophy of Time than is generally recognized. Undoubtedly there is a real antithesis between the two philosophers, but it is interesting to find the philosopher of the Absolute himself declaring that Pure Time is an abstraction, and to find him stating, in an almost Bergsonian manner, that time is much more than the spatialized abstraction of externality, that really time is *angeschaute Werden*, directly apprehended Becoming, and that if mathematically presented it can only be arrested and paralysed in the quantitative unit and rendered a sham, indifferent, external, and lifeless.² This reads like Bergson's attack on the spatialized time, but it is Hegel, the idealist apostle of the Eternal Absolute, who speaks. Close reading of Hegel reveals other sentiments in which these two minds are not by any means poles asunder. Bergson has not as yet ascended into the heights of the problems with which Hegel, Kant, and Spinoza dealt, although further utterance by him on some of the problems of social ethics and of religion is expected. Meanwhile the student of contemporary thought cannot help feeling that a careful synthesis of the Hegelian viewpoint with the attitude adopted by Bergson on some questions would result, not in a mere eclectic unity, but in a real and simultaneous grasp of the temporal and the eternal qualities of our life and of the Cosmos.

Time is inseparable from the Absolute even although we hold the Absolute not to be in time. We cannot postulate temporal experience of the whole. The notes flow on, but the music-piece, which is reality, does not itself move or change

¹ Ward, *The Realm of Ends*, p. 469, in the Supplementary Note on "The Temporal and the Eternal", critical of Hegel's view.

² Hegel, *Werke*, VII, par. 254-8.

in time, for both change and time are within it. The whole is a permanence which changes. Change and time are real although they are not ultimate. All progress and all time are within the Whole. Time, while not itself the ultimate Reality, is truly one form of manifestation of that Reality.

That in the actual passage of events something should actually come to pass, something new which previously was not, that history should be something more than a translation into time of the eternally complete content of an ordered world, this, argued Lotze,¹ is a deep and irresistible demand of our spirit, under the influence of which we all act in life. Without its satisfaction the world would be not, indeed, unthinkable and self-contradictory, but unmeaning and incredible. While rejecting the lofty Absolutism of Hegel's Idealism, Lotze refers at length to the problem of Time in his *Metaphysic*, and, as against the newer followers of Hegel, acclaims Time to be an essential characteristic of existence. Lotze grasped the contradictions involved in the conception of Absolute Time of the Newtonian kind as involving some other Time in which it flowed, and so *ad infinitum*. "If", he says, "we think of Time as a line", then "it would only possess one *real* point, the present. From it would issue two endless but imaginary arms, Past and Future."² He showed the unintelligibility in the conception of the flow of time. Does it flow as a whole or only its parts? If it flows as a whole, then, as the whole of Time includes past and future, the future must exist simultaneously, which is false and absurd. The same absurdity arises if only the parts flow. Suppose, then, that Time is a stagnant medium for events and that it does not flow at all. This supposition is absurd also, for the parts of time are successive, and this is an essential characteristic. Its parts never co-exist (and there is no final term). Abstract Time presents the difficulty that its parts never co-exist.

In 1897 Lotze dealt with this problem in the *Drei Bucher der Metaphysik* and also in his *Grundzüge der Religions-philosophie*. He speaks of succession as valid for finite beings and of time as related to them, while the Deity is conceived as not only personal, but as timeless in accord with Platonic, mediaeval,

¹ Lotze, *Metaphysic*, sec. 65.

² *Ibid.*, sec. 138.

and Hegelian conceptions. There are, however, as Geijer, Falckenberg, and Höffding have each pointed out, extreme difficulties in matters of interpretation and in the ascertainment of Lotze's precise position, which lay in a compromising loyalty to idealism and naturalism.¹

Lotze's work in general presents to all readers a difficulty in determining the precise nature of his views. Few philosophers have been more capable than he in presenting the various aspects of a problem, but Lotze's own final opinions are often most difficult to ascertain. Hesitating to be dogmatic, he often lacks clarity and definiteness. This is true of his philosophy throughout, but it is particularly true of his treatment of Time.² We shall endeavour to make clear his position.

At the outset we may note that he was not very hopeful of psychological investigations into the nature of time being fruitful. "The psychologist may, if he pleases, make the gradual development of our ideas of time the object of his inquiry, though, beyond some obvious considerations which lead to nothing, there is no hope of his arriving at any important result."³ But while agreeing with Lotze that it is fundamentally a metaphysical problem, we must investigate later what contribution psychology has to make to the study of time. For the metaphysician, the fundamental problem about Time, argued Lotze, is the question of its reality. It is viewed by him as "one comprehensive form in which all that takes place between things as well as our own actions are comprehended. The only question which he (the metaphysician) has to ask is how far Time, thus conceived, has any application to the Real or admits of being predicated of it with any significance."⁴

Lotze directs himself to the elucidation of this problem in

¹ Reinhold Geijer, *Lotzes tankar om tid och timlighet i kritisch belysning*. The uncertainty of Lotze's position on the Time problems has been set out in a Swedish monograph by Geijer on *Lotze's Ideas of Time and Temporality*. On the controversy in the interpretation of Lotze in addition to Geijer's monograph, article by Falckenberg, "Die entwicklung der Lotzeschen Zeitlehre" (*Zeitschrift für Phil. Kritik*, Bd. 105); Höffding, "Lotze und die Schwedische Philosophie" in *Philosoph. Monatschrift*. 1890. German translation.

² Lotze, *Metaphysic*, Bk. II, Chap. III, "Of Time", pp. 238-69.

³ *Ibid.*, Bk. II, Chap. III.

⁴ He dismisses psychological investigations with scorn and goes right to the heart of the metaphysical problem. He wants to examine time, not merely our awareness of it.

his *System of Philosophy (Metaphysic)*. At the outset he protests against certain habits of thought in this direction. We have no primary and proper perception of time. Further, our visualizing of time by spatial analogies is more mischievous than helpful. The conception of a line involves that of a reality belonging to all its elements, but time cannot be so represented. "Thought of as a line, it would only possess one real point, namely the present. From it would issue two endless but imaginary arms, each having a peculiar distinction from each other and from simple nullity, viz. past and future. The distinction between these would not be adequately expressed by the opposition of directions in space." This is, of course, because to represent time we need a *sense* to the line, and we need to remember that the sequence of time is not co-existent in the manner of the parts of the line. The parts of time do not co-exist, and it is this *flux* which is an essential feature of time. Lotze points out that "the single real point which the present constitutes is in a state of change and is ceaselessly passing over to the imaginary [*sic*] points of the past, while its place is taken by the realization of the next point in the future."¹

Equally difficult is the thought (so frequently met with in poetry) of time as a stream.² This is open to the same objections as the line and to an additional objection: that a stream requires banks between which its waters may flow. On this analogy time would need a second entity in which to flow, a second Time in relation to which its own flow might be measured. This is, however, to suggest a quite "unintelligible background".

It is also unsatisfactory to regard time as an order or series of terms, such as $m + 1$, m , $m - 1$, for the characteristic of time is that the order is traversed. The unique feature of presentness moves along the terms.³ Events come into being and pass away; they are not *co-existent* in an order although

¹ Lotze, *Metaphysic*, Bk. II, Chap. III, "Of Time". English translation, pp. 238-9. For imaginary point we should have here *remembered* point, otherwise it is incorrect and also in conflict with the previous statement that Past and Future differ from each other.

² This image is the basis of Matthew Arnold's poem, *The Future*, where Time is depicted as a river flowing between banks to the sea. Cf. also Pollok, *The Course of Time*. Many religious hymns use the image freely, e.g. "Time, like an ever-rolling stream, bears all its sons away". Lotze refers particularly to this idea as faulty (p. 241). Mere Time, he claims, could not do this.

³ See in Chapter VI Broad's emphasis upon this very point (p. 288).

their position in the order is eternally fixed by their happening. With regard to the relations of, and character of, events, Lotze asserts that "there would be no meaning in the statement that things exist in time if they did not incur some modification by so existing, which they would not incur if they were not in time". It is frequently asserted that the stream of Time "bears all its sons away", i.e. carries the events along with it as a stream takes down floating objects. But Empty Time could not do this; and even if this were admitted, Lotze reminds us that "it is not a mere change in the place of something which throughout retains its reality, but an annihilation of one reality and an origination of another, that we mean to signify by the power at once destructive and creative of the stream of Time". But this would only make our riddle worse. "Empty Time would be the last thing that could afford an explanation of the selection which we should have to suppose it to exercise in calling events, with all their variety, into existence in a definite order of succession."¹

The immediate and inevitable consequence of these considerations is, Lotze rightly shows, the rejection of Empty Time as an independent efflux. Empty Time has no existence; it is neither a permanent nor a flux including the sum of events within its bounds. But with his invariable shrewdness Lotze will not rejoice, or let his readers rejoice, that he has established one point, if even a negative one, in his view of Time. He adds: "But the certainty with which we reject this view (of Empty or Absolute Time) does not help us to the affirmation of any other."

Lotze then reveals his differences from Kant on this question. He rejects the view of Time as a merely subjective form of apprehension. The Absolute Time of Newton he equally rejects. Time cannot have any existence prior to other existence. Against Kant, Lotze feels that the problem of Time is inseparable from the intrinsic nature of the Real, and is not merely a question involving phenomena. Lotze has rightly seized upon the truth that an examination of Time involves an examination of Reality.

He claims that if Empty Time were conceivable, he would find no difficulties in the Kantian antinomies. But these might,

¹ Lotze, *Metaphysic*, p. 241.

he suggests, be simplified to refer to time rather than to the world, which is superfluous. The Thesis might just as well assert of time that it must have a beginning and then proceed with that alteration throughout. "For, on the supposition that time has no beginning, before any given moment of time there must have elapsed an eternity, an endless series of successive *moments*. Now the endlessness of a series consists in this, that it can never be completed by successive synthesis. An endless past lapse of *time* is therefore impossible, and a beginning of it necessary." He questions the relative position which Kant here assigns to the thought of the endlessness of time on the one hand and that of the impossibility of completing the endless series by synthesis on the other. Kant considered it obvious that the latter constitutes a reason against the former, whereas Lotze is tempted, on the contrary, to consider it merely an obvious but unimportant consequence of the Thesis. "For undoubtedly", urges Lotze, "in contemplating an endless lapse of time, we suppose that a regress from the present into the past would never come to an end and that accordingly we could not exhaust the elapsed time by a successive synthesis of the steps taken in the regress. The two thoughts are thus perfectly consistent, and the endlessness of the past would not be found to involve any contradiction until we could succeed in discovering a last stage in the regress. Presumably, indeed, Kant merely meant by the second thought to exhibit more clearly an absurdity already implicit in the first. But it is just on this point that I cannot accord him an unqualified assent."¹

The impossibility of coming to an end cannot be regarded as disproving the endlessness of time. Lotze here must be quoted in his own words: "Kant speaks expressly of a *successive* synthesis and of the certainty that the infinite series can *never* be exhausted by it. If we insist on these expressions, it is clear that the course of time, the infinity of which is alone ostensibly impugned, is itself already regarded as a real condition antecedent of that activity of imagination, which attempts the synthesis said to be fruitless. The several steps of this activity follow each other. Now whatever the celerity with which this task of adding moment to moment may be supposed to be

¹ Lotze, *Metaphysic*, p. 243.

carried on, no one will maintain that it is achieved more quickly than the lapse of the moments which it counts. The mental reconstruction of Time in time by means of the successive synthesis of its moments will take as much time as Time itself takes for its own construction; therefore an endless time, if Time is endless. And this is, in fact, as it seems to me, the real meaning of the word *never* in the above connection. It cannot have the mere force of negation, *not*. It only asserts what is in itself intelligible: that no succession in time, neither that of our mental representation of time, nor that of Time itself, can measure an infinite Time in a finite time. But no inner contradiction lies in this progress from point to point. This is the more apparent from the consideration that the progress must be supposed really to take place if we are to conceive the possibility of the successive synthesis, by which we are said to learn that it continues so endlessly as never to be completed. It is not with itself, therefore, that the endlessness of Time is in contradiction, but only with our effort to include it sinfinite progress in a finite one of the same kind."¹ But earlier in this paragraph Lotze had written (p. 244): "It is by the succession of moments that every section of time comes into being. Therefore no wrong is done it by the question whether its infinity is attainable by the method of successive synthesis, which ceases in this case to be merely the subjective method followed by our thought."

The objection may, then, be considered that this applies only to the future naturally conceived as an endless progression, but the past, if infinity be ascribed to it, would compel us to assume a finished and ready-made Infinity. This difficulty, Lotze maintains, rests on a confusion of ideas, due to Kant's expression, "up to any moment of the present an infinite series of time must have elapsed". It is improper to represent this series as having an end in the present. Lotze follows up this important point by throwing light on Kant's "arguments by bringing out the distinction of past and future and the relation of these to the arguments". The true ground of the misunderstanding is, according to Lotze, as follows: "It is true that in regard to Empty Time, though we would fain make this distinction, we cannot show that it obtains, for one point of

¹ Lotze, "System of Philosophy" (*Metaphysic*), p. 245.

the elapsed void is exactly like every point of the void that has still to come. But if we think of that course of the world which fills Time, then the future presents itself to us as that which, for us, at any rate, is shapeless, dubious, still to be made, while the past alone is definitely formed and ready-made. Only the past, which indeed, *is* not, but still has known what Being is, we take as given and as in a certain way belonging to reality. For every moment of what has been the series of conditions is finished, the conditions which must have been thought or must have been active in order to make it the definite object which it is. This character of what has been, since it belongs to every moment of the past, is shared by the whole past of the world's history, and is transferred by us to Empty Time. Thus, as a matter of course, when we speak of an endless past, we take it to be the same thing as saying that this endless past '*has been*'.¹ But it is quite a different notion that Kant conveys by his expression '*gone by*'.² This is the term used of a stream, of which it is already known or assumed that it has an end and exhausts itself in its lapse. But there is nothing in the essential character of the past to justify this assumption. Nothing is finished but the sum of conditions which made each single moment what it has been. To say, however, that this determination is in each case finished is quite a different thing from saying that the series of repetitions of this process is itself closed, and must be held to be given as a closed series or to have gone by, if it is to be equivalent to the series of what has been. The latter is indeed the assertion of Kant, but the thought so expressed is not one necessarily involved in the conception of that which has been, so as to be alleged as a disproof of the assumption of an infinite past. All that can be said is that whoever thinks of an infinite past, thinks of an infinite that has been. Why he should not think this does not appear. He will simply deny that the conception of what has been contains a presumption of its being finite. But that, on supposition of an infinite past, we should never come to an end in an attempt to reconstruct the past by the successive synthesis of a process of imagination is not anything to surprise us. It is the natural result of our assumption. A

¹ *Sei gewesen.*

² *Verflossen.*

contradiction would only arise if the infinity asserted broke off anywhere."¹

Lotze objects to the progress method of approaching the infinite. This method certainly cannot give us a definition of it. For that progress admits of being carried farther is just what cannot have been learned by any actual experiment. Any such experiment must have stopped at some finite limit without any certainty that the next step in advance, which unfortunately had not been taken, might not have exhausted the infinite. The infinite is conceived as endless, and therefore in it an end cannot be found, and we do not go looking for one by such a process, for the quest is contrary to the initial conception, which is in effect that no end can be found. "If", says Lotze (in agreement with Renouvier, his French contemporary, who made much of this point), "we continue the series of numbers by the addition of units, the infinite cannot be found as a number. To require that it should be so found would be to contradict our definition of it." We may put Lotze's point in another way. Just as "to-morrow never comes", in the sense that there is always a to-morrow to come, so in the numbers the series does not break off where our synthesis comes to an end. The *time-series* does not have an *end* in the present; only the *past* has a temporary and changing end there. Time is not a mere present, and to give an end to the series which merely agrees with our synthesis up to *to-day* is a quite arbitrary proceeding, equivalent to the assertion that "to-morrow will not come".

We do not escape these difficulties by rejecting Empty or Absolute Time. They will still be there, even if we *look to the real process of events* and regard this as producing in some way *the illusion of there being an Empty Time*. This regard for events raises our hopes that Lotze will develop his own view of Time in relation to events, but he passes from a rejection of a stream of Empty Time to the consideration of the view that time is merely a subjective way of apprehending what is not in time.

The attempt to present in a timeless presentation what is in time breaks down. Reality, however much it may be conceived as timeless, must be translatable into forms of Time. The world is a world of events and processes. These are inconceivable

¹ Lotze, "System of Philosophy" (*Metaphysic*), pp. 246-7.

apart from time. Yet it cannot be that the mere lapse of time in itself can bring events into being. Empty Time, concludes Lotze, does not cause Becoming, but rather Becoming produces Time. It is an impossible view which conceives on the one hand an empty stream of time and on the other the system of cause-and-effects, so that one may throw an event, as it were, into the stream of time and see it simmer into a succession. "It is only in the actual content of what happens, not in a form present outside it into which it may fall, that the reason can be found for its elements being related to each other in an order of succession, and at the same time for the times at which they succeed each other."¹ In short, Time as an empty absolute is nothing in itself, nor can it engender reality. It is itself the product of Reality, which, as Activity or Becoming, brings into successive being the events which constitute time.²

There remains, however, this further question; Admitting that Activity produces time, does this mean that it produces a process of events in real time or only that it produces the appearance of time in us? It is not sufficient to answer "Yes" or "No" to the two parts of this question, for some more complexities arise. The events of time may be regarded as a product of Activity, but the product itself passes away.³ It is not, so to speak, manufactured and left standing. To extend Lotze's suggested analogy here we might say that as soon as the product is turned out it is immediately exported to the limbo of the past. Again, with regard to the second portion of the query, Lotze points out that past and future do not exist and are not real. This is true in relation to and contrast with the present, and the transience of events is, of course, the vital point under consideration, but there is a danger in the tone of Lotze's remarks here. The past is radically different from the future. The past has happened; it has been present, and its reality lies in its having existed when it did. Events, as he himself puts it, acquire *seriatim* the character of the present and then of the past. He rightly warns us against confusing the

¹ Lotze, *Metaphysic*, Bk. II, Chap. III, p. 252.

² Again, compare Broad's similar remarks (next chapter).

³ "Time", says Lotze, "does not remain as a realized product behind the process that produces it" (p. 253). We have, we suggest, expressed the significance of Lotze's point more clearly. History is surely a realized product even although it is not all present.

past with the remembrance of it, or of mistaking foresight for the future itself ("in the few cases where it is possible"). The future, he paradoxically suggests, is only real when it is no longer future but happens, i.e. is present.¹ It seems here that Lotze is restricting the term "real" to the present in order to contrast it with past and future. The present, we might suppose, is the actually happening. But Lotze denies this by a rather curious assertion. It is not, he argues, the mere fact that they happen which attaches this character to the contents of events. On the contrary, the import of the statement that they happen is only explained by the expression "the present", which Lotze interprets subjectively as meaning presented to a conscious subject. The legitimacy of this is a point which we shall contest in our concluding chapter.

Meanwhile we must observe that Lotze maintains that if we wish to put clearly before ourselves the view of the merely subjective validity of time in relation to a timeless reality, this is the position to which we are driven. This is, of course, natural. If we reject objective time at the outset we can only retain time as a name for our way of looking at things, not as the way things happen. Such a view claims that there is no real Time in which occurrences run their course or events happen, but merely that in the single elements of the Universe which are capable of but a limited knowledge there develops the idea of a Time in which they assign themselves their position in relation to their more remote or nearer conditions as to what is more or less long past, and in relation to their more remote or nearer consequences as to a future that is to be looked for more or less late. For such a doctrine succession in time is "something which our mode of apprehension alone introduces into things"—introduces in a way absolutely inevitable for us, so that our thought about things remains constantly in contradiction with our habit of presenting them to the mind's eye. Or, again, "if all that we had to take account of were an external course of the world, then it would *indeed cost us little effort to regard all that it contains as timeless*, and to hold that it is only in relation to our way of looking at it that it unfolds

¹ Not merely present to a consciousness (as such it might be foreseen), but objectively present, happening. Compare the discussion of the Future in Dunne's *An Experiment with Time*.

itself into a succession".¹ But this would be, as Lotze himself submits, a transference of the motion of the outer world to our own minds. This would reduce all time and motion to merely mental phenomena. It is not denied that there is undoubtedly mental time. We have a succession of ideas, but that succession we are only aware of because of our ability to hold in the duration of a specious present the sequence A, B, C. This, argues Lotze, could never be possible for the mind unless the mind transcended the succession. Otherwise we could never get from the bare succession of ideas to the idea of succession.² The mind is not itself reducible to the act of succession. Rather, he suggests, the mind can only be guided in assigning places in the succession by "some sort of qualitative differences in their content—by temporal signs, if we like to say so, corresponding to the local signs in accordance with which the non-spatial consciousness expands its impressions into a system of spatial juxtaposition".³

But these signs would not owe their origin to Time, empty or filled. They could only be derived from the peculiar manner in which each element is woven into the texture of conditions which determine the content of the world. For this reason he concludes that there is no need of a real sequence in time. Apart from time, he claims, a presentative consciousness "could be led by means of temporal signs, which in turn need not have their origin in time, to arrange its several objects in an apparent succession in the way of time".

This view is put forward largely because it is somehow necessary to save the appearance of time in the mind. This, however, could be avoided, or at least rendered less paradoxical, by a frank recognition of objective time as given in and with the events of the outer world. Earlier Lotze admitted⁴ that it is "in the dependence of events on each other that the reason lies of the order in which events occur", but he wrestles with the question whether "the real needed this succession on its own part in order to its appearance as successive to us."

¹ Lotze, *Metaphysic*, Bk. II, Chap. III, p. 261 (italics not in Lotze). We do not think the effort quite so easy as Lotze supposed.

² This, too, was one of Locke's problems.

³ In our last chapter the doctrine of temporal signs in Lotze and in Ward is critically examined.

⁴ Lotze, *Metaphysic*, p. 263.

To which he replies that "neither could the order of events be constituted by time if it were not determined by the inner connection of things; nor is it intelligible how time should begin to bring that which already has a sufficient cause to reality if that reality is still lacking to it". But this does not clarify the issue. Time, absolute and empty, could not condition the order of events, for it is nothing at all, but Activity in conditioning the order of events and bringing them into being gives time in giving the events in process, and *this is given objectively*. He seems to realize this when he says that "in a timeless system there would be no possibility of the change by means of which s_3 would be moved out of its place into that of s_4 ; yet this would be necessary if to one and the same consciousness that is to become present which was previously future to it. If one and the same timeless being, by its timeless activity of intellectual presentation, gives to one constituent of its existence the past character of a recollection, to another the significance of the present, to a third unknown element that of the future, it could never, if it is to be really timeless, change this distribution of characters. The recollection could never have been present, the present could never become past, and the future would have to remain without change the same unknown obscurity. But if there is a change in this distribution of light; if it is the case that the indefinite burden of the future gradually enters the presence of living experience and passes through it into the other absence of the past; and, finally, if it is impossible for the activity of intellectual presentation to alter this order of sequence, then it follows necessarily that not merely this activity, but the content of the reality which it presents to itself, is involved in a succession of determinate direction."¹

Lotze, then, with that characteristic manner which tends to bewilder his readers as to his own views, immediately follows this up by a statement entirely opposed to it, and in the same paragraph goes on to suggest the abandonment of the subjective view to which he returned at the beginning of the paragraph. Noting this, we shall smile at Lotze's "painful awareness" that his readers must be impatient to know his own conclusions about Time, and cite his remarks. Immediately

¹ Lotze, "System of Philosophy" (*Metaphysic*), p 264.

following the last quotation admitting that "the content of the reality which it presents to itself is involved in a succession of determinate direction", he says: "This being so, we must finally decide as follows: *Time as a whole is without doubt merely a creation of our presentative intellect.* It neither is permanent nor does it lapse. . . . But the lapse of events in time we do not eliminate from reality, and we reckon it a perfectly hopeless undertaking to regard even the idea of this lapse as an *a priori* merely subjective form of apprehension which develops itself within a timeless reality in the consciousness of spiritual beings."¹ Then, as a crowning phase of this philosophy of Time, baffling enough to unravel, comes a tragi-comic descent to bathos. "Thus at the end of a long and troublesome journey we come back, as it will certainly appear, to complete agreement with the ordinary view."

Time is not the absolute condition of the Activity, but the Activity, the operation of which produces events, produces time. But this Time, considered as a whole, is, after all, a vision, a way we have of looking at things, hence subjective. But Lotze means this to refer to Time in itself, which is, after all, but an abstraction from the process of events. This Empty Time in which we imagine events to be is a subjective form of apprehension, but the succession of events, the Activity which makes this arrangement of events possible, belongs to the *most proper nature of the real*.

Hence we now ask: Where does Lotze really stand in regard to Time? The answer to this lies in the above statements, provided they are read in conjunction with his denunciation of the error of severing the thing that happens from its happening. This error is akin to that which speaks of laws of nature as existing apart from the particulars which they describe. To believe in an Empty Time in which events are is like supposing that a motion and its velocity are two things and not one. It is like speaking of velocities as prior to motion, as if the motion selected one among several pre-existing velocities, which is absurd. The velocity is given with the motion, and, save by abstraction, inseparable from it. Time conceived as absolute or empty is a mere subjective abstraction. The real world we know is a world of events in which the events and

¹ Lotze, *Metaphysic*, p. 265.

times are as inseparable as motion and velocity.* There would be no velocity without motion; there would be no time without events.

But though Lotze was obliged to give up the hopeless attempt to regard the course of events in time merely as an appearance which forms itself within a system of timeless reality, yet he says we must endeavour to understand the motives of the efforts which are ever being renewed to include the real process of becoming *within* the compass of an *abiding* reality. The whole of existence cannot, he sees, be equated with the limited present. "The history of the World, is it reduced to the infinitely thin, for ever changing, strip of light which forms the present, wavering between a darkness of the past which is done with and no longer anything at all, and a darkness of the future which is also nothing?"¹ What exactly happens when the operation is at work or when the succession takes place, which is said to be characteristic of the operative process? How does it come to pass—what makes it come to pass—that the reality of one state of things ceases and that of another begins?

Lotze has correctly realized that to ask, What is the nature of Time? is to ask, What is the nature of Reality? We speak of the process, and tend, at least in some of our moods, to include, as he says, the real process of becoming within the compass of abiding reality. We seek to include the temporal in the embrace of the timeless, and this, too, Lotze recognizes as a problem whose further discussion can alone be continued on the plane of the philosophy of religion.

This aspect of the problem Lotze raises in his *Microcosmus* in his discussion on "God and the World". He there suggests that we, as finite beings, cannot know the process as a whole, and it only could be so known to a being who stood outside it. There may be a sense in which, for God, past, present, and future are simultaneous. But "any finite being placed at some particular spot in a timeless system would always necessarily see as its future some one special content, whether clear or obscure, and some other as its past; life which makes the former more and more clear and the latter gradually more and

¹ Lotze, *Metaphysic*, p. 268. The passage is repeated in *Microcosmus*, Vol. II, p. 712.

more faint is not conceivable without a real stream of occurrence which carries consciousness past the content of the world, or the content of the world past consciousness, or lets both change together".¹ There does not exist for God the condition which binds *us* to one definite spot in the Universe. God, says Lotze (recalling a mediaeval phrase), is not a member of this whole, but as its all-embracing essence is as near to any one part of this reality as any other; and although there lie open to His all-penetrating knowledge those inner relations by which this whole would be systematized into temporal order, yet for Him no particular point has exclusively the specific worth of *the present*; for God this belongs to the infinite whole. This is a view which, as we shall see later, Royce was to develop in his Gifford Lectures on *The World and the Individual*. Statements about the Deity and Time are admittedly speculations, and many of them can be admitted as valid enough, but even if we are prepared to admit that for an omniscient consciousness all events (past, present, and future for us) would be present, there would still be a specific set of events which would differ qualitatively from all others present to them. They would be those events present *to us*, and this not merely because

¹ Lotze, *Microcosmus*, Vol. II, Bk. IX, Chap. V. English translation, p. 711.

The problem as to whether consciousness is carried past the content of the world or whether that content is carried past consciousness is raised by Dunne in *An Experiment with Time*, especially in the discussion (with diagrams), pp. 117-21. He challenges both Bergson and Broad. His own view is based on the plea of what we may term a kind of "experimental prophecy" based on dream experiences, which oblige him to draw the line of events well ahead into the future while our waking consciousness moves up to them. Bergson's view, says Dunne, introduces the "totally unnecessary hypothesis of adding to the past by a process of creation out of nothing. This is", he says, "a very strange proposition and one for which we have no evidence whatsoever." Likewise he would reject Broad's doctrine of the non-entity of the future, although he does not name Broad.

We must here observe that Dunne does not offer his experimental prophecy as scientific evidence, but even assuming it, his experiences are no grounds for the views he erects upon them—serial time, infinite regress, etc.

Then, again, time implies more than merely the subjective fact that *we* come up with events, for the events come up to the present by objectively happening in turn. This objective happening is what alone makes them present. Even if the future be presented in dreams, *the flow of events is still fundamental to time*. The issue seems to turn on whether presentness moves along a given line of events or whether the line of events moves in the other direction through a stationary present. The status of the Future depends on which of these alternatives we adopt. From the point of view of strict experience they are the same for us, but the difference is important for the Theory of Time and the Future. Cf. Guyau's remark, p. 243.

they are presented to *us* (that alone would not justify any difference to *Him*), but because present means also happening or occurring objectively. This point should not be overlooked, for even if God knows all Time, He must, so to speak, know what time it is, in the sense of what portion of the whole is now objectively happening.¹

Like Reid, Lotze essays a further speculation in this connection as touching the Deity, Time, and Free Will. The omniscience, which is affirmed of God, could not be perfect unless it included knowledge or foreknowledge of the future. To attain by inference to a knowledge of the future which has its causes in the present is a prescience possible for us in a limited degree and belonging to God to an unlimited extent; but what, he asks, can be the meaning of saying, as people do, that God foreknows that which is to happen through free will in the future—not as something that must come, but as something that *will* come? If the future does *not exist*, how could this non-existent (unless represented in the present by its causes and thus *not free*) stand in any other relation to cognition than that which never will be, and how, therefore, could it be distinguished from the latter,² “from pure non-entity”, as Broad would style it?³

This is a point discussed by Broad and Royce as well as by Reid, to which Lotze gives his own reply. Free actions have

¹ This kind of discussion came up in regard to the mediaevals and Reid, and will come up again in regard to Broad and others. The point here made against Lotze is an objection never really faced by those who postulate the whole as present to God. That, we urge, cannot override his knowledge of our present or the objective present as a happening. “There is no contradiction in supposing that God’s specious present might compass the entire history of His Universe”, wrote Professor Laird. “If so, the creeping aeons would literally be his eternal *now*, but the order of earlier and later within it would not be altered by a hair’s breadth either relatively or absolutely” (*Contemporary British Philosophy*, Vol. I, p. 220). Quite so; but this hardly goes far enough on this point. God would know *where in the time-order His world had got to*. However, we re-echo Laird’s own sentiment that “these possibilities, perhaps, have only a speculative interest for mankind”.

² Lotze, *Microcosmus*, Vol. II, Bk. IX, Chap. V, p. 708.

³ Broad. See our discussion in Chapter VI on “Time and Contemporary Metaphysics”. For Broad the future is a non-entity. Osty claims, in his *Supernormal Faculties in Man*, that the future is seen—merely and simply *seen*, not inferred from the present or the past. Flammarion, in his volume, *Before Death*, discusses the relation of “what will come” to “what must come”. But we may well ask if there is any real difference. Surely what *will* come must come? Does not the one imply the other? See Chapter VII, Section IV.

their place in timeless reality, not as non-existent and future, but as existent. For, he explains, "although not conditioned by the past, they would be unmeaning unless they had reference to present occasions which furnish the ends at which they aim and unless they attained reality by producing results. Hence their place in this timeless existence is determined not by members which succeed them as conditions, but by members which succeed them as conditioned or are co-ordinate with them; hence omniscience need not foresee free action as something that will be, but can observe it as something real, which, regarded as a temporal phenomenon, has its place at some definite point in the future."¹ We may leave Lotze at this point, remembering Laird's comment that the human *now* is not eternal, and that these are, after all, speculations of the finite mind about the eternal, and, as Lotze himself remarks: "It is certainly a somewhat strange proceeding when we finite beings, who are so often reminded of the limits of our knowledge, ask questions concerning the possibility and conditions of omniscience and expect an answer to our questions."²

Wundt, a thinker who was less subtle and more dogmatic than Lotze, regarded space and time, in his *Logik*, as forms or dispositions of all that is given in perception. They are thus constant contents of all experience, an expression, according to him, of continuous thought or activity; and although they are forms of perception, they have a more objective character than "qualities", which are subjective. Rational knowledge, however, as he shows in his *System*, involves *real transcendence* of what is given in experience. Perception cannot give us a unified world, and metaphysics thus becomes the work of constructing concepts which, while not contradictory of experience, surpass the perceptually given of experience. In this way it extends series, such as the event-series of time, and by extension and synthesis arrives at the concept of Time.

In his *Logik* Wundt pointed out that to each of Kant's three main theses in his metaphysical deduction an antithesis can

¹ Lotze, *Microcosmus*, Vol. II, p. 713.

² E.g. the problem presented by the alternatives in our footnote on Dunne's conception of the Future may be for us insoluble,

be stated.¹ Wundt maintains that there must be some correspondence between the time-form and the perceived succession. But the time-form is presented as a co-existent order and the *nach einander* feature of empirical succession excludes such simultaneity. The numbers 1 to 10 are an order, but the counting of 1 to 10 implies that when one member is present the others are not present in like manner. Time is not a mere order, but, as Lotze showed, an everchanging present. Time, Wundt affirmed, must depend upon experience for its character, but he did not clearly state what that character is which temporal experience manifests.

Both the English and French contemporaries of Lotze, Spencer and Renouvier, had something to say on Time. Spencer, in his *First Principles*, affirms that "the abstract of all sequences is Time."² Further, Time is inseparable from sequence, but he rejects a Kantian conclusion. Space and Time are not original forms of consciousness under which sequences and co-existences are known. "Our conceptions of Time and Space are generated, as other abstracts are generated, from other concretes." For him Time is not an *a priori* form, but a concept which has been *evolved* as the result of experience.

In further arguments Spencer considers that our time consciousness is purely relative and that the question of Absolute Time is for us unanswerable, as it belongs to that fetish of his philosophy which he here invokes, "The Unknowable". Time, as we know it, is a relative reality, and we cannot conceive it as either limited or unlimited. "When we imagine a limit, there simultaneously arises the consciousness of a time beyond the limit. This remoter time, though not contemplated as definite, is yet contemplated as real. Though we do not form of it a conception proper, since we do not bring it within bounds, there is yet in our minds the unshaped material of a conception."³

Spencer raises the question whether Time is objective or subjective. To say Time exists objectively is equivalent to

¹ Wundt, *Logik*, Bd. I, S. 429. See the whole section on "Zeitanschauung und Objective Zeit", ss. 428-37.

² Spencer, *First Principles*, p. 146.

³ *Ibid.*, p. 79.

calling it an entity. We cannot call it a non-entity, for a non-entity is nothing and cannot exist objectively or subjectively. Time is not a thing, so we must say it is nothing, and this involves us in the absurdity of having two kinds of nothing, the nothing which is Space and the nothing which is Time. Again, Time cannot be an attribute of any entity, for we do not know any such entity, and if we did, and eliminated it, Time would not disappear. Hence it must be something, not a non-entity or the attribute of an entity, therefore an entity. Entities are known by their attributes. But we are unable to assign any attribute to Time. (This is quite incorrect, but is Spencer's assertion.) We cannot even determine whether it is limited or unlimited; thus we cannot conceive Space or Time as entities, "and are equally disabled from conceiving them as either the attributes of entities or as non-entities. We are compelled to think of them as existing and yet cannot bring them within those conditions under which existences are represented in thought".¹

If in this difficulty we turn to Kant it is merely "to escape from great difficulties by rushing into greater". Kant's solution that Space and Time are forms of the intellect or *a priori* laws or conditions of the conscious mind does not help us, for it asserts Time and Space to be subjective and denies the objective character of Time and Space, which, says Spencer, are not in but without the mind and exist objectively apart from mind. Spencer's criticism is here legitimate, as also his further point against Kant, namely that he confuses form of intuition and matter of intuition, conditions of consciousness and objects of consciousness. If Space and Time are forms of intuition, they can never be themselves intuited. As it is, on Kant's admission, impossible to suppress the consciousness of Space and Time, then they are objects of consciousness. But if they are objects of consciousness, how can they also be conditions of consciousness?

From all this discussion of the difficulties about Time, Spencer concludes that it is (with Space) "wholly incomprehensible. The immediate knowledge which we seem to have of them proves, when examined, to be total ignorance. While our belief in their objective reality is insurmountable, we are

¹ Spencer, *First Principles*, p. 41.

unable to give any rational account of it. And to posit the alternative belief is merely to multiply irrationalities.”¹

Such a conclusion helps us little, even less than the criticism of Hume, and it is in part due to Spencer’s amazing statement that Time has no attributes. After such an unwarranted, impatient, dogmatic assertion as this, the conclusion about total incomprehensibility is only natural, for Spencer had cut off any clues he might have gained to the understanding of its nature.

Equally unsatisfactory is his discussion in his *Principles of Psychology*. Spencer there shows his interest in the *genetic* problem of the origins of our ideas of Time—an interest which, correct enough in psychology, mitigated against his grasping the ontological questions involved in the Time problem as a whole, and led to his utter misunderstanding of Kant’s *a priori* doctrines in his own treatment in *First Principles*, where he was confronted with Time not as a psychological but as a meta-physical problem.² Spencer argues that the notion of sequence precedes the notion of co-existence. Time is known by irreversible sequences, Space by reversible ones. He points out that in early times Space was expressed in terms of Time and now we express Time in terms of Space. This only means that we measure Time by Space. By itself it might easily lead to an erroneous identification of time with our measurement of time. He asserts that rate of time varies for different species. “The scale of time proper to each creature is composed primarily of the marks made in its consciousness by rhythms of vital functions, and secondarily by marks made in its consciousness by rhythm of its locomotive functions, but which sets of rhythms are immensely different in different species.” This, after all, says nothing about time, but only about the creature’s awareness of it.³

Spencer called Hamilton to task for his assertions of inconceivability in regard to the two Kantian antinomies, about the infinite divisibility and infinite extent of time. In each case

¹ Spencer, *First Principles*, p. 43.

² *Principles of Psychology* Vol. II, Chap. XV, “The Perception of Time”.

³ In any case, it can hardly be maintained that a real sense of Time or concept of Time belongs to non-human creatures. On this point cf. Baer’s lecture, *Welche Auffassung der Natur ist die richtigste*, and paper by Vassilieff [*sic*] at Sixth International Congress of Philosophy, Harvard, 1926 (*Proceedings*, pp. 65-74).

one assertion must be true. It may be equally difficult to regard time as infinitely divisible or infinitely indivisible, but one of these must be true. Spencer did not see the value here of considering whether it was perceptual or conceptual time that was involved, and did not himself follow up the distinction in any helpful manner. Again, with regard to the infinity of extent, he said it is no doubt equally easy to conceive that Time had a beginning or has an end, but one of these must be true. It is a *fortiori* inconceivable that both are true. This was a point which Renouvier developed more definitely. Again, Spencer returns to the Kantian attack begun in his *First Principles*. "That Space and Time are nothing more than subjective forms was with him, as it has been and will be with every other, a verbally intelligible proposition, but a proposition which can never be rendered into thought and can never, therefore, be believed."¹ In a discussion of "The Reasonings of Metaphysics", criticising Kant's views of Intuition, Understanding, and Reason, he refers to "Kant's doctrine that Space and Time are subjective forms, *which have nothing objective corresponding to them*".² This again seems to be a misunderstanding of Kant. In spite of his importunate stress on the subjectivity of time, Kant specifically pointed out that this form *does*, in fact, correspond to phenomena. It is quite true that Kant unfortunately refused to admit that objective events were the ground of our subjective time, and we have classed his view as subjective, but Spencer's remark here shows again how superficially he had read Kant and how inadequately he had grasped his treatment.

Neither Spencer nor Mill (who referred somewhat hesitatingly to the same problem in his *Examination of Sir William Hamilton's Philosophy*) contributed anything of value to the discussion of Time, and the remarks they did make received severe treatment at the hands of the great French thinker of that day, Charles Renouvier, who was writing his neo-Kantian philosophy in the decade 1854-64.³

¹ Spencer, *Principles of Psychology*, Vol. II, p. 500.

² *Ibid.*, Vol. II, p. 350.

³ On this great thinker see the writer's volume, *Modern French Philosophy* (1922). Renouvier's *Essais* in their first form filled four volumes, but they were rewritten and revised in thirteen volumes, concluding in 1897. They deal with Logic, Psychology, Philosophy of Science, and Philosophy of History.

This French contemporary of Lotze and Spencer dealt with the problem of Time in his *Essais de Critique générale*, in which he formulated his "néo-criticisme", partly based on Kant's views, but differing radically from Kant on many matters, notably on Time. Renouvier criticizes Kant's formulation of the antinomies, and with regard to the one on Time, he rejects the Antithesis on the ground that he is in no way obliged to recognize a relation of the Universe to a space outside it or a time before it, as both space and time are to be understood only as relations within the universe. That Universe, claims Renouvier, has had a real beginning in Time. Neither the Universe nor Time is infinite.¹

Renouvier found the fundamental feature of time to lie in the relation of before-and-after. The particular relation of the posterior to the anterior is a relation of succession. "Le rapport général de l'*avant* et de l'*après* au présent qui a pour limite l'instant, est la loi du temps."² Instants are merely the limits or ends of a *durée*, interval, or stretch of time. With regard to past time, we err, says Renouvier, if we consider this to be infinite in extent. His philosophy of *néo-criticisme*, while it owes much of its form to the work of Kant (as he acknowledges), rejects much of the content of Kant's work. Nowhere is this more marked than in dealing with the antinomies, especially the one about Time. For Renouvier the world is finite, limited. "The idea of the eternity of the world is self-contradictory."³ There cannot be an infinite regression into past time, for the world of phenomena or events had a beginning—that is to say, proceeded from a (creative) act which did not stand at the end of a series of preceding phenomena. "We must", he writes in his *First Essai Critique (Logique)*, "reject the antinomies stated by Kant after explaining their origin. Of the two antinomies, the one is proved by the principle of contradiction and is true, while the other pretends to a proof by the laws of experience extended beyond the realm of possible experience and is false. The argument of Kant places in the opposition of antinomies

¹ Renouvier says in his *Logique générale et Logique formelle*, Vol. II, p. 215; *Essais de Critique générale*: "Je ne suis point obligé de reconnaître un rapport du Monde à un espace hors de lui et à un temps avant lui, l'espace et le temps ne se comprenant clairement que comme rapports dans le Monde."

² Renouvier, *La Nouvelle Monadologie*, pp. 8-9.

³ *Ibid.*, p. 16.

a proposition which is contradictory with a proposition that is simply incomprehensible and whose contradiction is self-contradictory.¹ The world and time have had a real beginning. "I admit", he says, "the thesis by virtue of the principle of contradiction; I reject the antithesis because I am not at all obliged to recognize a relation of the World to a space outside it and to a time before it, space and time being incapable of being expressed clearly save as relations within the World." The world is misconceived if we look upon it as an infinite whole, for it is contradictory to suppose that an infinite could be given at all as a whole or universe. The series of events or phenomena, as given, is limited and finite, and it is only a confused logic which applies to them a principle of indefinite multiplication by supposing an infinite regress. The Absolute (or *le tout-être*) must not be confused with the existence of a quantitative *infinity*, which is an erroneous and self-contradictory conception.

Passing from Kant, Renouvier turns to other thinkers. He disagrees with Spencer and Bain in their attempts to reduce space to time, and the singular discussions of those thinkers and J. S. Mill about the Kantian thesis that all sensations are actually successive and that simultaneity is only apparent.² We have already seen how absurd and erroneous was this view of Kant. Renouvier devotes several further pages to the views of Spencer about Time, brings out Spencer's misunderstanding of Kant, and displays the inconsistencies and obstinacies of Spencer's own arguments.³ In a special note in his *First Essay* Renouvier points out the difficulties in Spencer's

¹ Renouvier, *Essais de critique générale. Premier Essai*, Tome II, p. 217 (ed. 1912).

² Mill's discussion is in his *Examination of Sir W. Hamilton's Philosophy*.

³ "L'argumentation de M. Spencer contre l'apriorisme à propos de la notion de temps serait un des plus étonnants exemples de cette aberration de la vue à laquelle sont sujets les auteurs de systèmes, quand ils portent les yeux sur les doctrines adverses qu'ils veulent décrire en quelques mots et réfuter."

"Enfin, peut-on concevoir que la série des perceptions, des comparaisons et des expériences portant sur diverses *relations de position*, cette série dont M. Spencer veut accumuler les termes avant que le temps devienne *concevable*, que cette série, dis-je, ait lieu et que le fait même qu'elle a lieu, ou seulement qu'elle commence, ne soit point une application de la loi de temps et ne suppose pas ainsi le temps comme chacun se le représente?"

"Que devient (adds Renouvier) le critère de la croyance universelle constatée par l'*inconcevabilité* de la négative?" (Renouvier, *Essai de Critique générale (Logique)*, Tome I, p. 223.)

view of time and traces them to his assumptions about inconceivability. For Spencer was obliged to admit propositions whose negative was inconceivable. "So far", says Renouvier, in concluding his criticism of Spencer, "from the Universe being inconceivable because of its characteristics, Space and Time, it is the application of the laws of Space and Time, essential to the formation of our concepts, which renders the Universe conceivable."¹

The supposition of a Time in itself—one, indivisible, and absolute—suppresses all relation between Time and the representation of time, for it becomes impossible to relate the times of our experience to the supposed Absolute Time. The flying arrow, it is said, is motionless. This is not true without the qualification, "à tout instant fixé dans le temps".²

Renouvier considers objective time, and regards Kant's view of time as a form of sensibility as only true of time joined to "quality" and consciousness"; time, however, is not limited merely to contact with consciousness, but is essential in all the processes of nature and is not dependent on being perceived. It is not merely a quality of mind, but of external nature, and as such has an objective reality. This insistence by Renouvier on the *objectivity* of time is one of the most definite and valuable statements in post-Kantian thought.

We might also note here a writer (contemporary with Lotze and Renouvier) who dealt with the Time problem, Shadworth Hodgson. He does not give a very convincing or even satisfactory view of Time, although, in addition to his work on *Time and Space* (1865), his four volumes on *The Metaphysics of Experience* (1898) contain a long-drawn-out discussion under chapter headings of the "Moment of Experience" and the "Time-stream". His curious form of empiricism and his inability to sever the psychological from the ontological serve to detract from the worth of these discussions. Their quality varies inversely as their quantity.

In discussing, in his volume *Time and Space*, the formal element in consciousness, Hodgson affirms four principles:

1. That phenomena which are perceived in two dimensions of space—phenomena of the senses of touch and sight—

¹ Renouvier, *Premier Essai de Critique générale (Traité de Logique)*, Tome II, p. 245.

² Cf. Renouvier, *Essai de Critique générale*, Tome I, pp. 40-9.

although also occupying time, do not owe their occupation of superficial extension to their occupation of time, but that their space-relations are not capable of analysis into relations of time.

2. That phenomena occupying time do not owe their objectivity to their being referred to phenomena occupying space.
3. That phenomena occupying space do not owe their subjectivity to their being perceived in time.
4. That phenomena of both kinds in time and in space owe both their objectivity and their subjectivity to reflection, irrespective of their being represented in reflection as occupying space and time.

Certain affinities with Kant mark his philosophy, which regards time as a formal element present in all consciousness, and so subjective in character. Time is a necessary concomitant of conscious experience, but does not, according to him, exist externally.

He regards time and space as inseparable, being the two formal modes of consciousness "different but inseparable and simultaneous. The two senses which reveal space, sight, and touch exist simultaneously with those which reveal time by itself; hence, their inseparability in any way except provisionally, and hence the difference in the modes of connection between them, namely that in all time there is involved space as its accompaniment, in all space there is involved time as its element".¹

Hodgson attacks the Mill and Bain school for their treatment of problems of time and space historically, or, as we should say, genetically. "What time and space as cognitions, or as forms of feeling, are, is a question to be kept entirely distinct from the question as to how we, or minds involved in bodies, come by them. Their nature, value and importance to consciousness alone are distinct from their history."² This is perfectly sound and distinguishes the metaphysical investigation of time from the psychological question of how the individual becomes aware of it. But Hodgson himself seems to forget this. His

¹ Shadworth Hodgson, *Time and Space*, pp. 117-18.

² *Ibid.*, p. 120.

purely empirical and perceptual treatment never rises beyond the confines of a view limited to the psychological content of the present moment. The existence of time is, after all, for him purely subjective. It is only because we cannot "think away" time that it exists, not because it is given objectively by the events and processes of the outer world. Time for this writer is always our awareness of, or thought of, time.

He thus expresses himself: "Time has one dimension—length. It is infinitely divisible in thought; it is infinitely extensible in thought. It admits of no minimum in division, of no maximum in extension. For these reasons it contains every thing; nothing is short enough to slip through it, nothing long enough to outrun it. It is one in nature, for all its parts are still time. It is incompressible, for no single part can be annihilated."¹

He fails to make clear the distinction of time as percept and time as concept, and his further remarks about divisibility apply, of course, to conceptual time, although he does not say so. As against Mill, he shows that to postulate in this connection a *minimum divisibile* is a denial of divisibility without residuum. Like Spencer, he attacks Hamilton for cheerfully accepting contradictions because of inconceivability. Hodgson claims that to regard time as infinite is not contradictory with regarding it as finite, for the sense in which the term is used in the two cases is different. Instead of claiming that conceptual time is infinite and perceptual finite, both as regards extent and divisibility, he makes the amazing statement, "Time and Space as *finite* are concepts", and adds by way of explanation: "Time and Space as finite are modes of voluntary consciousness, of consciousness adopting a purposed limitation; as infinite they are modes of involuntary consciousness, which we can never transcend so long as we are conscious at all."²

Hodgson's views here are perverse. He further states that time as infinite is a percept. This is pure perversity of thought and leads one to ask whether such a writer knows what "percept" and "concept" usually mean. His statements are exactly the reverse of the truth. No one ever perceived the whole of time and if time is regarded as infinite, it is in conception that this is done, certainly not in perception.

¹ Shadworth Hodgson, *Time and Space*, pp. 121-2.

² *Ibid.*, p. 140.

Shadworth Hodgson's later work, the extremely verbose *Metaphysics of Experience*, is equally valueless. His chapter on "The Moment of Experience" in these four volumes cannot be set beside the much more concise and valuable paper on the same subject at a later date by Wildon Carr (since reprinted as a chapter of his work, *A Theory of Monads*). Duration is for Shadworth Hodgson a fundamental experience. He also considers that the simplest experience contains both present and past. "The time-stream is not marked out into past and present portions previously to being perceived, but its divisions are perceived in and with the first knowledge which we have of it, as part and parcel of the stream itself."¹ He emphasizes the fact that we perceive extent of time or duration within which lies succession. Time is thus bound up with change. It is in process or in change, as actually perceived, that time-duration is perceived as an inseparable element in it.² He recognizes but does not analyse fully the fact that the perceived present differs from the objective present, and considers that their identification is not only a gross fallacy, but is "the parent of a numerous progeny" of errors about Time. "Few terms in philosophy", he remarks, "are used in greater varieties of significations than the term *Time*, and since it is at once one of the most familiar, as well as one of the most fundamental, of all our ideas, the ambiguities and differences of opinion to which it gives rise are, as may easily be imagined, almost ineradicable." These difficulties and ambiguities partly arise from confusion between time as a percept and time as a concept. Again Hodgson fails to work this out, but he is aware of the difference and himself regards perception as fundamental, "the earliest and simplest form in which we know it, the origin of all our further knowledge about it, the source from which all the other significations given to the word are derived".³ Four different meanings of the term "Time" are distinguished by him. The first he styles "Abstract Time", which he regards as an *ens imaginarium*, an imaginary unilinear medium in which all things take place and all unchanging states exist. Secondly, he cites Abstract Time, which itself changes or flows. This is Newton's Absolute Time,

¹ Shadworth Hodgson, *The Metaphysics of Experience*, Vol. I, p. 127.

² *Ibid.*, Vol. I, p. 137.

³ *Ibid.*, Vol. I, p. 138.

which is said to "flow equably", and its equable flow is made to serve in mathematics as a standard of measurement to which other variations are referred. Thirdly, *time* is used in the sense of an order or series of empirical occurrences considered as discrete and successive, like day and night, the seasons, the ticking of a clock, the beating of waves on the beach. This time of events Hodgson claims to be the sense in which Aristotle was thinking of it when he described time as "the measurement of motion".¹ The fourth sense involves, not a succession of empirical occurrences (events) which may or may not include intrinsic change, but the abstract relation of succession between empirical occurrences (events) each of which is taken as unchanging for a moment at least and has its beginning and end simultaneous. These occurrences are called present moments ($\tau\acute{\alpha} \nu\tilde{\nu}\nu$), and the relation of succession between them is time in this fourth sense.

Hodgson never really leaves the percept or the present. His treatment of the past is mainly a treatment of memory, so like Augustine of old he escapes from metaphysical difficulties into the surer haven of psychological facts. His treatment of the future is likewise a discussion of anticipation and the sense of effort. He never, in fact, rises beyond the subjective and the purely perceptual level. This is true in spite of a statement that "the time of which any percept is a portion is an object, or rather an objective though abstract element", for he adds that it is "just the same in kind, that is, just as much perceptual as its parts, not distinguished from them, as a general term is from the particulars which it covers, but as a *perceptual* whole from its perceptual parts. Time as an abstract element of consciousness depends on abstraction from feeling, but this does not convert it into a concept or logically general term. It is an individual though abstract percept, as well as being numerically one. The notion that time is a logically general term or concept, standing to all particular portions of time as genus to species, is a notion which has wrought great mischief in philosophy."²

This statement shows us where we really are with this voluminous and unsatisfactory writer. We are in the presence

¹ See our discussion in Chapter I.

² Shadworth Hodgson, *Metaphysics of Experience*, Vol. I, pp. 203-4.

of one who does not know what "conceptual" really means. The last sentence recalls a difficulty expressed by Kant.¹ Hodgson, for all his empiricism, is a weak and half-hearted Kantian straining at the leash which effectually binds him to the perceptual present. Time as a whole he claims as a percept.² It is ridiculous to affirm that the whole of time is perceptual. No human being ever perceived the whole of time.

Hodgson's empirical standpoint leads him to emphatic assertion of the adequacy of perception and to be discourteous to, and indeed sceptical of, conceptual time. He is right in asserting that perceptual time is fundamental, but he apparently considers it final. For him reality is the mere presence of the phenomenon to consciousness. He is wrong in his view that we arrive at conceptual time by analysis alone, for it is rather the result of synthesis. This treatment of problems will simply not do. It is too much a *mélange* of naturalism, materialism, and empiricism to be even inherently consistent. The attempt to reach Kant by his road is impossible. Equally futile is his attempt to get from logic to existence without proper psychological analysis of the meaning of sensation and sense data. He talks much of the percept, but never really analyses it. What he does say about duration and sequence is illegitimate. If a note C be followed by D, then A becomes by memory a "that" as well as a "what". There is no relevance here in introducing memory and no reason why "what" should become "that". His philosophy professes only to examine the "whatness" of experience, as distinct from "thatness" or existence. As a matter of fact he cannot get to existence at all from the logic to which he has bound himself, and his work remains a peculiar mixture of inadequate logic and superficial psychology hopelessly entangled. Ambitious as it is, the ambitions lamentably fail to be achieved, and Hodgson contributes little or nothing to advance our understanding of Time.

Lotze was difficult, vague, and inconsistent, but Hodgson

¹ Noted above under discussion of Kant, where his objection to Leibnitz on this point is brought out.

² "Time as a whole has a single infinite, or at any rate infinitely bounded, percept." This sentence is nonsense. See Chapter VII, Section IV.

was perverse and futile in his treatment of Time. Renouvier was at least definite and brought out one valuable point—the objectivity of Time.

IV

Sigwart brought forward criticisms of Kant's doctrines of time and gave a modern significance to the difficulty, already noted by Plotinus, that measurement of time is a difficult matter and that measurement gives us no clue to its nature. The problem of measurement is the physicist's problem, and Sigwart saw how conventional and relative are our methods if we define time in relation to movement and then use time so defined in order to measure movement. To this problem, which has lately loomed so large in the development of human thought, we now turn before surveying the doctrine of Time in contemporary metaphysics.

In the earlier pages of his *Logic* Sigwart examines our idea of time in a manner which is not unlike some aspects of Kant's treatment. "The idea of time is inseparable from consciousness and is contained in everything which we experience immediately as our own states or our own actions. We find ourselves existing in time and acting in time, and the manifold which fills consciousness contains time as an element and is arranged for us in the form of a time-series. In this sense a time-series filled with definite content is given before reflection."¹ His view in this chapter appears distinctly subjective in character, for he says that if we attempt to conceive of time apart from content, then we get by abstraction the duration of our own conscious states and duration as a property of objects "*in so far as they are present to consciousness*".² He does not here consider objective time, i.e. time considered as a sequence of events which exist externally and are not necessarily present to consciousness.

"Time is *a priori*", he writes, "in the sense that in the laws which regulate consciousness this function is involved as necessarily taking place; it may be called a form in so far as the mode of connection is independent of any particular content,

¹ Sigwart, *Logic*, Vol. I, p. 58 (Dendy's edition).

² Italics mine.

but we can no more attain to the idea of time without a content which is experienced and retained in memory than we can attain to an idea of space which is not occasioned by stimulation of sense."¹

Time is, for him, a uniform continuum. While time is only known to us by filled content, he appears to accept Empty Time as a possibility, although he qualifies this emptiness by admitting our consciousness as enduring in it. On the other hand, for him there appears to be no distinction between time and our awareness of time, although in part this arises from his reference to the idea of time rather than time itself, especially in regard to sleep. He looks upon the indivisible moment as a limit grasped within a changing and flowing continuum, and, unlike Kant, he recognizes that in addition to the succession of particular perceptions we have perception of particular successions. This was a point which Stout, and particularly Bergson, were to stress at a later date.²

Sigwart (like Schopenhauer and, in our own day, Cassirer) refers to another Kantian problem—namely the relation of time to counting—but he rejects the identification of time with number, although he admits that it is easy to see how the ancients thought them identical.³ "But", he points out, "in number we have to do with a series of indivisible acts which need not necessarily be observed as passing through consciousness in a temporal series; so that when we have completed our idea of number we lose sight of the time which we used for counting. On the other hand, the basis of the connection between successive periods of time is the continuum of moments, which pass into each other without break; the acts which correspond to counting are limitations of a duration, and thus contain something which always remains divisible and cannot be produced from a combination of unities."⁴

The assistance of number is needed wherever we endeavour to express time quantitatively or to measure it. Our subjective measurements are inadequate. We are only certain of very small rhythmic intervals such as occur between the strokes of

¹ Sigwart, *Logic*, Vol. I, p. 59.

² See Bergson, *La Perception du Changement*; Stout, *Manual of Psychology*.

³ See above for discussion of Schopenhauer and Cassirer's remarks on counting and time. A fuller treatment of Cassirer's views follows in our next chapter.

⁴ Sigwart, *Logic*, Vol. II, p. 61.

a metronome, yet in spite of this handicap it is from this subjective measurement, Sigwart claims, that all our knowledge of equal durations starts, just as measurement by the eye is fundamentally implied in the fixing of standards of measurement. Our subjective measurement of time only suffices as a general mode of procedure for the construction of a general scheme of temporal order and magnitude, but "*it needs artificial aids for its application to the time of actual experience*".

Sigwart believes in a Time which progresses uniformly without limit and which is infinitely divisible. Our concept of Time is, however, as he recognizes, a complex thing embracing many interconnected, elementary or rather fundamental ideas which are necessarily interconnected in a system. "It is necessary", he asserts at a later stage of his work, "in order that even our purely subjective statements about what is contained in our consciousness may be fully determined, that our own subjective time should be referred to a time system which is common to all and so far objective."¹ This at once involves a standard of time reference independent of subjective estimation, depending upon external events which can be known by all and which occur simultaneously for all. "This can be achieved", says Sigwart, "only by the aid of hypothetical assumptions concerning the laws of motion." It was one of the defects of Kant's treatment that he failed to see how deep a problem this was.

"The use of these standards of time for the temporal determination of subjective events, and still more for the determination of the objective events of which they are perceptions, *necessitates the determination of the relation between the time of the event and the time of the perception and the reduction of the subjective series of perceptions to the objective series of changes in things.* This reduction can only be carried out by assuming causal laws in which the sensation is regarded as a temporally determined effect of objective change; but to establish such laws is possible again only by assuming that in the case of continuous events the succession of sensations corresponds to the succession of events. From this point of view Kant's doctrine that an objective time determination is only possible by means of a principle of causality, according to which objective events

¹ Sigwart, *Logic*, Vol. II, p. 236.

prescribe to themselves their place in time, is, as stated in his formula, inaccurate."¹

In this passage Sigwart shows that he realizes the problems involved in objective time and the difficulties of time-measurement which have been so stressed by contemporary physics. He realizes that the problem resolves itself into the determination of simultaneity, for as the reference of the conscious content of one person to that of another person is only possible through the external world, this can only be made by means of a phenomenon which is external to both and is *simultaneously* perceived. For the individual consciousness the starting-point of reference is always the "now" with which memory connects the nearest past with tolerable confidence as to the sequence and duration of its particular moments and the more remote past with diminishing certainty with reference both to the before-and-after relation and to the particular intervals involved. This "now" or present is, however, itself changing, advancing in time. Sigwart likens it to the head of a moving comet followed by a constantly changing tail, as the "now" is always moving on and is followed by a chain of memories changing in form. Hence it is necessary to obtain an objective time reference by establishing fixed points of reference common to all and by obtaining a common measure for the intervals between past events and those of the common present. Merely a single coincidence or simultaneity would not be sufficient, as it would leave the series before-and-after without common points of reference. We must therefore seek repeated simultaneities or constant recurrences in the external world—in short, we must have a calendar. As "to-day" is always changing, some important event must be taken as a starting-point in counting days, months, or years. This is useful and valuable, but it is by no means a solution of the Time problem—in fact, it only prepares us for the real difficulties of the problem which were in the main grasped and demonstrated by Sigwart.

The system mentioned—the calendar—*appears* to involve only the assumptions that the rising (or setting) of the sun is perceived simultaneously and that days are counted in the same manner by everybody. But there are other assumptions and inadequacies. Do we know that the days are equal times?

¹ Sigwart, *Logic*, Vol. II, p. 237. (*Italics mine.*)

"A real standard of time could only be given by the perfectly uniform motion of a perceptible body, which would enable us to measure times which could not be directly compared by means of the spaces traversed, which spaces we could bring into direct coincidence by a measure."¹ Even Newton saw this, but he expressed doubts as to whether such a body could be found. Sigwart more ruthlessly maintains that "whether a motion is uniform or not can never be empirically known with certainty because there is no immediate and reliable certainty in our equation of subjectively estimated successive magnitudes". Then, reiterating a criticism made by Neumann in 1869 in his critique of the Galileo-Newtonian Theory, Sigwart leads us to the crux of the whole problem: "If we define a uniform motion as one in which equal spaces are traversed in equal times, then, in order to know it as such, we must suppose that we are able to measure directly the equality of two periods of time."²

Obviously this is a most serious matter, for it implies that the means we employ for measuring time depend upon assumptions which we cannot strictly prove—indeed, it suggests that we are really involved in a circle in our quest for a valid time-measurer. We are looking for uniform motions by which to measure time, while we can only know a uniform motion if we can measure its time. In raising this objection, which involves the use of planet and pendulum alike, Sigwart not only penetrated more deeply into the problem than did Kant, but he anticipated the difficulty which, arising out of the critique of the Newtonian view of Time, has led to the Theory of Relativity.

Recognition of the fact that an objectively valid measurement of time is possible only by means of external marks, and at best approximately, opens up new and important questions which Kant did not either face or see. The problem of recognizing and measuring simultaneity becomes of vital importance, for it is impossible to go on assuming that the objective event whose happening marks any point of time is actually *perceived* simultaneously by everyone. Equally impossible is it to assume

¹ Sigwart, *Logic*, Vol. II, pp. 239-40.

² *Ibid.*, Vol. II, p. 240. (The reference to Neumann is to his work, *Über die Principien der Galilei-Newton'schen Theorie.*)

that the interval between the perception of objective events is the same as, or in any way corresponds to, the interval between these events themselves, considered, as they must be, as objective happenings in an external world of change.

Even the problem presented by the time-order of the perceptions alone is a difficult one. We constantly assume that at least we know definitely the order of the succession of our perceptions, whether or no these have any correspondence to the actual succession of external events of which they are the perceptions. Our normal experience is one of succession of the before-and-after relation; we know that (in terms of perception) the mental event B follows the mental event A, both of them perceptions. We appear quite confident that we saw the flash of lightning and then we heard the thunder; that the first words of a spoken sentence were perceived by us and then subsequently the last; that we had breakfast this morning and then read the newspaper leader, not *vice versa*. But, unfortunately, while this confidence appears justified in practical affairs and in relation to matters not too distant in memory, it is found that if the perceptions be more intricate and more closely related by very small intervals our judgment *even of the order of our perceptions* becomes confused, erroneous, and uncertain, more especially if they involve events in different series or involve different senses. Sigwart brings this out quite clearly in his discussion of the "Determination of Time". Our inner life does not progress in a simple line of successive perceptions, for several distinguishable series proceed simultaneously. "We do not cease to see while we hear, and hearing continues while we consciously endeavour to compare the seen and the heard."¹

When we have to observe coincidences such as the contact of two small objects, such as the meeting of rays of light, the crossing of a thread by a star in the telescope, or the meeting of a moving hand of a delicate instrument with a given mark, we are unreliable judges, as the "personal equation" in astronomical observation shows, and then recourse must be taken to external instrumental devices as aids.

There being, in fact, no assurance that even our awareness

¹ Sigwart, *Logic*, Vol. II, p. 242. In other words, as we have previously stated, all our perceptions are not, as Kant affirmed, successive; some are simultaneous or contemporary.

of the order of our perceptions can be relied on, much less can we suppose that we can be *certain* of *any fixed* relation between those perceptions and the objective order of events of which they are the perceptions. Hence we are forced to admit that there appears to be no fixed or reliable calculable relation between the subjectively apprehended succession of perceptions and the succession of perceived objective events. It is therefore impossible to assume that some external event *happens* actually at the same time that we *perceive* it happening. While we may start with some such assumption, experience obliges us to abandon it. If we stand near a gun, we see the flash and hear the report in immediate succession (if not actually together); if we stand some miles off, the perception of the flash and the perception of the report are separated by a quite appreciable interval.

But it will be said that here is no real difficulty, for we know that both flash and report proceed from the same event, namely the firing of the gun. We know the cause and we relate the effects to it. In effect this was what Kant urged when he claimed that an objective time determination is possible only through the concept of causality. He considered that everything which happens presupposes something upon which it follows according to rule, the mere subjective order of perception warranting no objective judgment about the events themselves. Our knowledge of cause frequently leads us to a reversal of the temporal order given in perception, and this order is taken to be illusory.

For example, to quote Sigwart's case, "when a spectator watches a battalion exercising from a distance he sees the men suddenly moving in concert before he hears the word of command or bugle-call, but from his knowledge of causal connections he is aware that the movements are the result of the command, hence that objectively the latter must have preceded the former". Every such case involves us in correcting subjective illusions of this type by reference to some causal relation between the objective event and the sensation or sensations, the event being regarded as the cause of the sensations. It will be found that any accurate determination of this kind includes recognition of the difference of time, which is then explained with reference to the rate of transmission of

light and of sound over distance and of the time which such sensations take to travel along the nerves affected. Corrections of subjective experience are made in this way and show the effects of distance and of those individual psycho-physiological differences of "reaction times" in individuals. But, however much the variations or corrections necessary, the sensations are traced back to a cause and to causal relations. Thus we are able to calculate where the lightning is by the difference between flash and report; thus we reckon back from the time when a shot is heard or a flash seen to the distance of the gun and the exact time it was fired. This leads us to conclude that reference to causality is a criterion. Only in so far as we know that A is the cause of B can we say with certainty that the event A precedes the event B, whether in perception A precedes, or succeeds, or is simultaneous with B.

This reference to the principle of causality appears at first glance, as it did to Kant, to be conclusive, even although Kant did not mean to assert, as Schopenhauer thought he did, that every event is caused by the immediately preceding one. The principle of causality appears to give coherence to our time-order of events, even if it involves the admission that perception is deceptive and therefore an unreliable guide. In reality, however, we are only at the heart of the difficulty, for our belief in causal connection depends upon the fact that an objective succession of A and B was established *before* we could gain the conviction that A is the cause of B. We can only discover concrete causal connections and causal laws by perceiving that B regularly succeeds A; in short, our knowledge of cause has its roots in the time sequences observed by us. Thus, as Sigwart well demonstrates, we are confronted by an antinomy; before we can establish a causal connection, a rule according to which B follows A, we must be able to affirm with objective validity that B has followed A, but before we can affirm this with objective validity we must have recognized a causal connection between A and B.

Sigwart has thus brought out the difficulties in the problem and developed it beyond the unsatisfactory stages in which Kant left it in his "Analogies of Experience". At this point Sigwart turns back to Kant, not because he agrees with him—far from it—but because he thinks that further points may be

elucidated by critical comment on Kant's discussion of sequence and causality which, as we have already demonstrated, was open to criticism of the gravest kind.

It is not difficult for Sigwart to show that Kant was unable to distinguish what occurs when we see a house and when we see a boat gliding down a river. It is quite absurd to say that the perception of the parts of a house is successive in the same sense as the perception of the positions of the moving boat. The succession involved is quite different in the two cases, and Kant seems to have got into the difficulty by his erroneous generalization that all perception of a manifold is successive. This is to confuse disastrously the perception of the co-existent parts of an object with the perception of successive events. As a matter of fact, the perception of the house involves a perception of parts which, in whatever order they are noticed, are recognized as parts of a whole which is not changing, for there is no difference between earlier and later perception of it as a whole. In the case of the boat, however, there is that peculiar quality on which Stout and Bergson have laid stress, the perception of change, the awareness of a continuous succession of varying positions seen as a movement in the midst of an environment at rest. The perception is that of a movement, but it is movement of a boat. Hence the perception has that peculiar quality of identity and of difference. It is the one boat all the time, but the *positions* are different. All change, in spite of Bergson, involves something changing and involves some permanence. The situation would be entirely different if we looked the other way and saw another boat; that would be an entirely different perception. Here, however, we have that identity united with difference which is change in the object of perception. Kant affirmed that "every apprehension of an occurrence is a perception which follows upon another", but this as it stands is inaccurate. Sigwart points out that Kant, to be strictly correct, should have said that "every apprehension of an event is a perception which follows upon another partly different from, partly identical with it, and which is accompanied by the consciousness both of the difference and of the identity".¹

Thus while Kant finds "the condition for a rule according

¹ Sigwart, *Logic*, Vol. II, p. 247.

to which an event follows always and of necessity" in that perceptible fact which precedes an external event, Sigwart claims that the temporal relation of the apprehension of two events must follow from the temporal relation between the two events and from the law according to which the moment of their perception is determined by their occurrence. In the case of perceiving motion, we assume that what is observed last happened last, and that the sequence of our perceptions is determined by an objective order of events. This assumption rests, in Sigwart's opinion, on experiments with our own limbs in motion and the perception of them.

By finding rules according to which the time of the perception is determined by the time of the event—e.g. the laws of the velocity of sound and light—non-continuous changes may be brought into an objectively valid order, the time relation between a visible phenomenon and the sound of a bell may be determined, and thus, in Sigwart's view "all perceived events may be brought into one time sequence. I am at once certain", he claims, "of the immediate succession between the visible perception of the hammer which strikes the bell and the sound, and it is upon this basis only I can establish any causal connection at all." The establishment of such a fact rests on the immediate and invariably recurring continuity of events observed at short distance. At longer distance, and, if equipped with this knowledge and an acquaintance with the delay in sounds, we can refer sound and sight observations to one cause and give to our perceptions a background of objective validity in the objective world of events. If (to quote a further example from Sigwart) one man is placed near a clock and another near a cannon 3,000 feet away, and the cannon is fired in objective simultaneity with the first stroke of the clock, then the first man will hear the report when the clock strikes for the fourth time, but the second man will not hear the first stroke of the clock until three seconds after the report. Neither of them will be justified in regarding the sequence of his perceptions as the sequence in the object until he knows the rule according to which sounds from different distances succeed each other in perception.

Sigwart's example contains a phrase which later was to raise acute controversy between Einstein and Bergson. What

is "objective simultaneity"? In spite of Sigwart's analysis, the definition of simultaneity at a distance and in regard to motion had still to be cleared up, but he was more concerned with criticising the defects of Kant than raising the problem in this form. His work is, however, of such critical merit as to entitle him to be regarded as a conspicuous link between the work of Kant and the physical work of the Relativists and other critics of Newtonian Time.

Reverting to Kant, he asserts his disagreement with Kant's belief that it is "an indispensable law of the empirical idea of the time series that the phenomena of past time determine every existence in subsequent time". "On the contrary", argues Sigwart, "we maintain that the empirical idea of the time-series is given, and absolutely certain in our immediate consciousness of inner events, that the sequence of our conscious states, which are also phenomena of the inner sense, is that which originally occupies time; and with reference to this we can no more speak of a distinction between a merely subjective and an objective sequence than we can of a rule according to which each moment of consciousness determines the following moment."¹

It is then open to ask, what objective order in the causes of our inner events is necessitated by the laws according to which these inner events are produced by the objects of perception. But the difficulty here lies in the fact that we cannot comprehend in one causal chain all the events of the universe. The world of experience only gives us series of connected events, but the series appear to work themselves out independently of each other, and multitudes of simultaneities appear unconnected with each other. It is, further, extremely difficult, as Sigwart saw, to relate these simultaneities at a distance of events in distinct, irrelevant series. For this we are obliged to turn, as Barrow suggested, to apparatus and, although Sigwart does not himself say this, to light signals. We reach, in short, the problems of Relativity and a stage at which apparatus appears bearing its own peculiar problems.

Sigwart sums up his own analysis in these words: "All time-determination starts first from the assumption that the objective sequence of changes in objects corresponds to the subjective

¹ Sigwart, *Logic*, Vol. II, p. 250.

sequence of those changes as perceived. This assumption continues so long as it does not lead to contradictions; where it leads to contradictions, it is not immediately abandoned, but further assumptions are based upon it concerning the time-relations between event and perception by which these are connected with varying conditions, and the assumptions are continually modified until all the data agree. Thus the whole process is hypothetical; we modify our original and unpremeditated assumption, and find a guarantee for the correctness of the proceeding neither in immediate empirical observation nor in an *a priori* principle (for which, in the generality in which Kant states it, we should have no rules of application), but in the agreement of all the consequences which follow from our hypotheses."¹

In closing he reminds us that what must be admitted in Kant's view is this: "If an objective time-determination is possible only under assumptions which represent the sequence of subjective perception as depending according to law upon the sequence of events, then these assumptions must themselves harmonize with those causal laws of phenomena which are grounded upon them, and must rank merely as a part of the causal laws by which we interpret the course of events and endeavour to know them as necessary. For in so far as our own perception must be regarded as merely a part of the general causal connection and as manifoldly conditioned by it, the aim of our investigation is to represent that which enters into our perceptions as a result of a system of laws (uniformity) connecting all events; and there is no doubt that in detail the particular values of time-determinations which we ground upon the subjective perception of inner events are subject to subsequent corrections, although the basis upon which we rely must have some claim to objective validity before we can even try to establish universal causal laws about phenomena."²

The period of Kant and his successors shows a discussion of time *as percept and as concept*, and a *struggle between the subjective*

¹ Sigwart, *Logic*, Vol. II, p. 252.

² *Ibid.*, Vol. II, p. 251.

and objective viewpoints in relation to time with *increasing stress on objectivity* as a feature of time. This struggle has led to the conflict on the field of contemporary metaphysics, with Bergson, on the one hand, denying the existence of objective time and mischievously equating time and our subjective awareness of it, and on the other hand the physicists and the realists asserting its objective existence, but the physicists limited merely to an interest in its measurement. The development of the problems of time-measurement as culminating in the Theory of Relativity constitutes a link between Kant and our vigorous contemporary, Cassirer, who bears in relation to Einstein something of the position in which Kant stood to Newton.

CHAPTER V

THE PHYSICISTS AND THE PROBLEM OF TIME-MEASUREMENT

Culmination of work of Galileo, Barrow, Newton, Berkeley, Sigwart, and Poincaré. Objective Time. Absolute Time. The frame of reference. Events and signals. The difficulties of measurement. Importance of the velocity of light in this connection. Experiment of Michelson and Morley. Paradoxical results. Implications of these facts. Lorentz and Fitzgerald contraction. Restricted and general Theory of Relativity. Bergson's criticism of Einstein's treatment of simultaneity. Real Time. Artificiality of physicists' calculations in mathematical form. Minkowski and the Space-Time conception. Palágyi's doctrines of Space-Time as unity. Subjectivity of Bergson and Maritain criticized. The Objective viewpoint. Cassirer's views. Special value of his work. Measurement of Time gives no clue to its nature. This remains a metaphysical problem.

I

IN Locke's treatment of Time the nature of objective or physical time in contrast to subjective or mental time was discussed, while in the doctrine of Newton a concept of Absolute Time was set up. In some respects Barrow, Newton's predecessor, was more conscious of the difficulties involved in such a concept than was Newton. The doctrine of Absolute Time was criticized by Berkeley, Hume, and Leibnitz, who put forward a Relative Theory in place of the Absolute doctrines of Newton. Kant found himself in grave difficulties in his "Analogies of Experience", where he raised but failed to solve the question of how we arrive at an estimation of the objective time-order of events in view of the fact that our subjective data do not correspond to the objective order of events of which they are perceptions. We noted Kant's futile attempt to explain time-order in terms of causality, which involved him in a vicious circle. Sigwart more clearly showed the difficulty of the determination of time-order owing to the fact that, if we refer time to a constant rate-measurer, we assume in so doing that we already know how to measure time. Long ago Plotinus urged that problems of *measurement* would give no clue to the *nature* of time, and this is profoundly true, but in view of recent developments in thought, and particularly the rejection of Absolute Time involved in the new physics, we must direct our attention to the problem of *its measurement*

as dealt with in contemporary physics before passing to the more fundamental discussions of *its nature* raised in contemporary metaphysics.

When we undertake the task of time-measurement, which is by no means so simple as it appears, we have always to resort to something other than time—usually to some movement, or set of movements, in space. Men employ, or have employed, in this connection varying devices, such as the burning of a candle, the operation of the sand-glass, the shadow of the sundial, water-clocks, mechanical clocks, and chronometers, which all measure time by a motion in space.¹ These methods are approximately regular and serve their purposes. The sun is a general indicator of day and night and of seasonal times.² For a wider field than the solar system we employ the velocity of light. No period of time can be measured apart from such methods as these, and our correct estimate of time must depend, therefore, on our correct measurements of space, and these we know only approximately.

If, then, we are to measure our time-experiences accurately, we must resort to something of a non-temporal character. We must employ signs, marks, or signals in space, or, as Barrow suggested, instruments. This becomes all the more necessary when it is realized that we have no consciousness of Empty Time or of the lapse generally of time during sleep, although some abnormal individuals are reputed to possess a sub-conscious awareness of the passage of time in this respect, and most patients in the hypnotic state show a curious and striking precision in their knowledge of time.³ The employment of signs or signals is vitally necessary in view of the fact that our perceptual experience of time is so personal and subjective.

¹ The most accurate time-measurer is the "Shortt clock" in which a pendulum operates practically *in vacuo*. A short account of the problems connected with such measurements, including the importance of pendulums, the introduction of "invar", and kindred matters is to be found in Bolton's book, *Time-Measurement* (1924). It is worth noting, however, that although this book is by the author of a previous work on Relativity (1921), this volume on Time-Measurement has nothing to do with Relativity.

² Astronomers speak of several types of "day"—e.g. the Sidereal Day, the Mean Solar Day—and also of the Tropical Year, the Sidereal Year, and the Anomalistic Year, all of slightly different lengths.

³ See Chapter VII, where this matter is brought under discussion in connection with the psychological analysis of our experience of time.

The demands of social life make a common measurement of some kind imperative. Newton thought that there was also a need for a constant standard of reference in physics, and it was this which led him to postulate his theory of "Absolute Time". This conception has been supplanted by the newer theories in physics, particularly the Theory of Relativity.

Our measurement of time must be based upon events. However spatial may be our manner of measurement, it must have its basis in events, or a series of events, or processes. We look around for any series of recurring events, such that the time-interval between the events will be the same. Then if we suppose a definite interval between events of this recurring series, we must find means to measure it. In the world of space we have little difficulty with measurements of extension, for we can provide ourselves with a foot-rule, which is constant and which we can apply to all that we wish to measure. This cannot be done in a direct manner with time, and when we have found our interval it is by no means easy to divide up the period of time into regular and equal intervals.

Man early fixed upon the rotation of the earth on its axis as a convenient measure, although he styled it the rising and falling of the sun in the sky. These periods of night and day were assumed to be the same length of time, i.e. isochronous.¹ The ancients marked shorter periods by burning sections of a candle or by letting a fixed amount of sand run through a glass tube. The assumption was that these periods were isochronous—that is to say, that the time-interval between any two noons was equal, also the interval between any sections of candle or between any two successive fillings of the hour-glass. The modern physicist would select as an isochronous process the swing of the pendulum. Other ingenious methods of obtaining a measure or standard for time-intervals have been employed.

Some writers, as, for example, Ritchie and Whitehead, have called attention to the fact that in the case of very *short* time-intervals we have a primitive perception of equality and inequality by the sensibility of our hearing, by our perception

¹ Eddington has shown this assumption to be incorrect. The days are lengthening throughout the years at the rate of one minute in 6,000,000 years (statement in *Nature*, January 6, 1923). See also discussion in Karl Pearson's *Grammar of Science*, Chap. V, "Space and Time", sec. 13, "Conceptual Time and its Measurement", pp. 186-91.

of rhythm. Eddington has even suggested that there may be brain motions or rhythms on which a mental clock may work and be read by the mind. The *normal* pulse is very regular, and the story goes that Galileo timed the swinging lamp at Pisa by his pulse.¹

Let us examine the pendulum, and test its isochronic value by reference to another pendulum. Let the two pendulums be set swinging. Should their swings not be equal the divergence will show itself in an increasing manner as they swing. If, after a little time, no divergence is apparent, we may assume that their swings constitute synchronous processes, as one pendulum relative to another. But we do not know that the swings are absolutely synchronatic processes, for both pendulums might vary together. Further, we may assume that equal periods of time are measured by these processes, and may state in accordance with them the laws of nature which involve a time-element. We assume that the successive revolutions of the earth upon its axis are strictly isochronous. In accordance with this assumption we formulate, and endeavour to verify, the laws of motion.

But here the matter, instead of coming to a final and definite ending, only opens out and becomes exciting for the investigator. For when our reckoning of time is measured by a physical process, and our laws of motion are precisely stated in terms of such time-process, slight discrepancies occur. These are not such as can be accounted for by experimental errors merely. Either the laws are only partially correct and our clocks are right, or our clocks are "out" and the laws are right. We can then do one of two things:

1. Keep our simple and supposed correct laws as rigidly true and accuse our time-measurement of inaccuracy.
2. Change the formulation of our laws and keep to the time-measurer.

In the case of the earth as a time-measurer, it has been pointed out that defects in its isochronism can be explained as due to the friction caused by the mechanical action of the tides. But in certain cases no such physical explanation is

¹ Cf. Ritchie, *Scientific Method*, Chap. V, on "Measurement", p. 142. Whitehead, *The Concept of Nature*, p. 137.

forthcoming, and a real change in the form of the laws then becomes imperative.

Astronomers reckon by the sidereal "clock" based on the time-interval between the passage and repassage of the same star across the meridian. Thus the sidereal day, or the duration of the rotation of the earth as measured by reference to the fixed stars, is the accepted unit for the measurement of time. Even this is not satisfactory, for we have no guarantee that two complete rotations of the earth about its axis have the same duration. We have already remarked on the suggestion that the earth is slowing down continuously by the movement of the tides, which act as a retarding influence upon it. Astronomical facts show that the moon appears to go slightly more quickly round the earth than it should in theory, and that this discrepancy is due to "our clock", the earth, losing time and going more slowly. In his *Etude sur les diverses grandeurs* Calinon remarked, as far back as 1897, that "one of the circumstances of any phenomenon is the velocity of the earth's rotation". If this velocity of rotation varies, it constitutes in the reproduction of this phenomenon a circumstance which no longer remains the same. But, as Sigwart also pointed out, "*to suppose this velocity of rotation constant is to suppose that we know how to measure time*".¹

The same difficulty was expressed by Andrade in his *Treatise on Mechanics*. In an endeavour to show the *relativity* of our notions of time, several thinkers have claimed that if all the movements in the universe were doubled we should not be able to discern, or at least (and perhaps more strictly) to measure, any difference at all. This suggestion was made by a Spaniard, Balmes (1810-48), and both Laplace and von Baer asserted the same thing.² There was an interesting symposium on this

¹ Quoted by Poincaré, *La Valeur de la Science* (1905), Chap. II, sec. 5. Cf. Ritchie in his volume *Scientific Method* (1924): "Unless the time measured is independent of the laws of motion the whole science of mechanics is a gigantic fraud."

² Laplace's suggestion preceded that of Balmes by several years. Laplace's *Système du Monde* appeared fourteen years before Balmes was born. There is an erroneous statement on this point made by Vasiliev in his *Space Time Motion*. Laplace's definition of Time is worth noting, as it recalls Hume's views: "Time is the impression left upon our memory by a series of events whose existence we know to have been successive." We have already criticised and condemned Hume's view.

point, in which Renouvier, Delboeuf, Bouasse, and Lechelas participated, an account of which is to be found in the last thinker's *Etude sur l'Espace et le Temps* (1896). This supposition may be contrasted with that of the cessation of change suggested by Barrow, to whose work and influence on Newton we have previously referred. "Do I say that we would not perceive the flow of time? Most certainly not, nor would we perceive anything else, but, bound in a continued stupor, we would remain stock-still, like posts or rocks."

A clock is (generally) a mechanical device possessing some part moving with a uniform velocity. The notion of velocity is necessary for a clock, although, admittedly, we test other velocities by the clock.

In the time-flow the more permanent contents furnish the background upon which the fleeting ones appear and disappear. Some of the latter observe a certain rhythm. In the case of the earth-clock and our artificial time-piece based upon it, we have socialized this rhythm, establishing a calendar or common time-reckoning. Then we use this rhythm to measure the enduring contents. Having invented intervals, we can divide these at will, even to infinity. We then invert the process and imagine that the contents run through our artificial divisions. Commenting on these difficulties, Poincaré pointed out that "there is not one way of *measuring* time more true than another; that which is generally adopted is only more convenient. Of two watches, we have no right to say that the one goes true, the other wrong. We can only say that it is advantageous to conform to the indications of the first."¹

This statement puts the relativity issue concisely. One way of *measuring* time may be more true or convenient than another, but, as Plotinus urged, this tells us nothing of the *nature* of Time itself. Poincaré's statement only touches the physical problem of measurement, not the problem of the nature of Time, which is a metaphysical question.

The difficulties inherent in our measurement of time are particularly seen when we investigate our use of the word simultaneity, although difficulties of ascertaining simultaneity are not perhaps so great as those of obtaining equal times.

¹ Italics mine. The emphasis on *measurement* is vital, as this is all that is here involved.

As experienced by our own consciousness, the term "simultaneity" has an absolute and indubitable meaning. Two sensations are simultaneous when they are perceived instantaneously and not in succession.¹ Events are simultaneous as facts of experience just in so far as they are experienced together. But if two psychological phenomena occur in *different* minds, we have a different case, and one in which the testing of an alleged simultaneity becomes a highly difficult problem. Equally difficult is the problem when a physical phenomenon happening at a distance is stated to be simultaneous with an event in a mind remote from the scene of the occurrence. In 1572 the astronomer Tycho Brahe discovered a new star whose light had taken two centuries to reach the observer on the earth. The light reaching us now from a large star in the heavens started to travel to the earth in the year that Queen Anne died. Light from the nearest fixed star² takes four years to reach us, and from the most distant one known it takes 400,000 years. De Sitter reckoned that light returns to its source after traversing the universe in 100,000,000 years. Even sunlight takes eight minutes to reach us, and if the sun had suddenly been extinguished five minutes ago we should know nothing about the occurrence. Again, in the case of thunder, we see the flash of lightning and afterwards hear the sound. Knowing that sound travels more slowly than light, we impute both flash and explosion to the same cause. This problem we raised in our last chapter. We often explain time by causality. When a phenomenon appears to us as the cause of another we regard it as anterior. But we often define cause by time, saying that the anterior fact, the antecedent, is the cause of the other or consequent. Obviously we are involved here in the vicious circle of Kant and, as Sigwart showed, are in extreme difficulty with regard to time, cause, and simultaneity. Of two flashes of lightning, one distant and one near, the first may be anterior to the second even although the sound of the second comes to us before that of the first.

We can attempt to ascertain simultaneity at a distance by various methods. There are, as Broad has shown, grave diffi-

¹ As sensations, not, of course, necessarily as events, for this involves objective reference.

² "Proxima Centauri."

culties and inconsistencies in the attempt to base the measurement of simultaneity on sound.¹ We may take for the velocity of light the calculations of Römer in 1675, based on examination of the satellites of Jupiter and given as 300,000 kilometres, or 186,000 miles per second.² This, as Borel shows, can be compared with other estimates, both optical and electrical, which vary slightly.³ We may take longitude as a method, the problem then being that of telling "what time it is" at Greenwich without being at Greenwich. Other methods may be invoked, none of them infallible, such as the use of chronometers, observations of the moon, telegraph messages, telephonic communication, wireless messages, and light signals.

But whether a chronometer or a light signal be used, no *velocity* could be measured without measuring *time*, so that we are involved in a circle unless we can find a method of fixing simultaneities which does not involve the measuring of velocities. We have no direct and immediate awareness of the simultaneity of *events which occur at a distance*. We also have no awareness of the absolute equality of two durations. Unconsciously we become opportunists and adopt calculations which are not necessarily true, but are convenient. The qualitative problem of simultaneity is made to depend on the quantitative problem of the measurement of time. But we cannot separate the qualitative problem of simultaneity from the quantitative problem of measurement, because no velocity can be calculated apart from time, and, further, because it is only in so far as measures are referred to time-experiences that they gain their temporal character in science. The problem of Time is not merely psychological; it is also physical and metaphysical. We cannot separate the physical problem of time from the quantitative problem of measurement because, for physics, what "it is" and what it is *measured* are one and the same thing.⁴

¹ Broad, *Scientific Thought*, p. 61.

² It is interesting to note here a remark made by Eddington: "Time, as we understand it now, was discovered by Römer."

³ Borel, *L'Espace et le Temps*, Chap. V, "La Propagation de la Lumière", pp. 146-68. (Bradley, Fizeau, Cornu, Perrotin, Foucault, Michelson, and Morley.) (Ayrton-Perry, J. J. Thomson, Abrahams, Rosa, and Dorsey.)

⁴ Physics is mathematical largely because we know so little about matter, not because we know so much, and the mathematical side is what we seem surest about. (Cf. Schrödinger-Heisenberg controversy, also the Michelson-Morley experiment.)

In dealing with the difficulty of establishing simultaneity between events at *different* places, Eddington confesses that whatever method we adopt is a convention. This may have two forms:

1. A clock moved with infinitesimal velocity from one place to another continues to read the correct time at its new station.
2. The forward velocity of light along any line is equal to the backward velocity.

Neither statement, he carefully reminds us, is by itself a statement of observable fact, nor does it refer to any intrinsic property of clocks or of light; it is simply an announcement of the rule by which we propose to extend fictitious time-partitions throughout the world.¹ The use of the word "fictitious" is to be noted, for on a previous page (24) he states that the demand for world-wide partitions or instants arose through a mistake. In recent years the work of leading physicists has considerably shaken, and indeed transformed, many of the older conceptions of that science. In the main these older conceptions date back to the work of Newton and his Absolute Time. The Newtonian conceptions, it will be remembered, replaced those of Descartes and maintained themselves against the criticisms of Leibnitz. For two centuries physics accepted the fundamentals laid down in Newton's *Principia*.

In the eighties of the last century experiments were begun which showed clearly the discrepancies and difficulties in the Newtonian system of physics, which had been hinted at by Berkeley and Carnot. Berkeley was translated into German by Uberweg, who, together with Helmholtz, took up the problem before Mach. Both Helmholtz and Mach refused to accept the Newtonian doctrines. The development of electrodynamics and the criticisms of Mach, Maxwell, and Faraday shook the confidence in the Newtonian doctrines, while the work of other physicists and mathematicians prepared the way for Einstein's statements and theories.² The newer physics showed marked tendencies to depart radically from the Euclidean

¹ Eddington, *Mathematical Theory of Relativity*, p. 29.

² Michelson, Miller, Morley, Fizeau, Fresnel, Römer, Gauss, Clifford, Grassman, Levi-Civita, Larmor, Sommerfeld, Poincaré, Abrahams, Arago, Riemann, Minkowski, Lobatchewski, Fitzgerald, Langevin, and Lorentz.

and Newtonian concepts of nature. No one drew more attention than Mach to the difficulties in the classical theory which ultimately led to the formulation of the theory of Relativity. In an obituary tribute to Mach at his death in 1916 Einstein paid high tribute to his work and said, "that apparently Mach would have arrived at the Theory of Relativity if, at the time when his mind still had the freshness of youth, the question of the constancy of the velocity of light had already engaged the attention of physicists".¹ Mach, as early as 1872 and again in 1883 in his *Die Mechanik in ihren Entwicklung*, showed the inadequacy of the Newtonian doctrines, and his criticisms contributed to the new physics as much as did the researches of Maxwell and Faraday.

Einstein's theory explains the results which have been obtained from experiments with regard to light passing through a medium (Fizeau's "dragging coefficient"). It explains the change of mass with velocity, which occurs at high velocities. In its more generalized form it has explained the anomalies in the movement of the perihelion of the planet Mercury. Great interest attaches to his prediction of the amount of deviation in a ray of light passing near a large body such as the sun. As there has been considerable discussion over the exactitude of the observed measure of deviation, the matter cannot be regarded as having been conclusively and unanimously settled. We are not concerned here, however, with these problems in themselves, but only with the bearing of the Theory of Relativity upon the problem of Time.

We saw in dealing with the difficult problem of the measurement of time that although, unaided, we have no means of telling the length of time which has passed (i.e. although we cannot perceive "empty time"), yet normally our power of observation is such that we can correctly make a statement regarding order in time if not regarding duration. We can observe and comment upon the order of events. We decide that one thing or event is experienced before, or simultaneously with, or after another. Our friend to whom we refer the matter

¹ Einstein, in *Physikalische Zeitschrift*, XVII (1916). Quoted by Vasiliev in his interesting volume, *Space Time Motion*, written partly during the Russian Revolution and published in English with an introduction by Bertrand Russell in 1924. But note that Planck disagrees with the relation of Mach's work to that of Einstein. Cf. Cassirer, *Substance and Function*.

agrees that he too saw the events in the same order. There is little difficulty in the verification of this subject of judgment, particularly when the two observers are adjacent to each other. There is, however, grave difficulty in the judgment of precise time-order where we do not ourselves personally and directly experience the events.

How can we speak of the time-order of events which we have not ourselves experienced and which, it may be, no human being has directly experienced? In what time-order do they occur? Not in the time-experience of any consciousness, unless we are prepared to say that of the Deity. As we cannot give them any subjective reference, we must either *infer* the existence of an objective order, or on another theory affirm that we have direct knowledge of a world outside ourselves. In either case we reach the affirmation of a world of events, external to us—an objective world of events. It must be carefully noted that this neutral order, as one may style it, is postulated by us and may not have been perceived by or lived by anyone.¹ We infer this time-order and we conceive it in accord with logical and conceptual principles. We *do* experience objective time, not as our own time-stream, but as the time associated with the motion of things. This is what Kant meant by his distinction in the Second Analogy. It must, of course, be remembered that the *measurement* is a matter of method and inference.

It is of importance to determine what criterion, under these circumstances, is to be used for the assertion of the simultaneity of events. As we cannot directly, as one mind, observe the events X and Y, for they may be occurring at different places on the earth's surface, one in A trench and one in B trench, or one in London and one in Melbourne, how do we determine whether the event X in relation to Y precedes it, succeeds it, or is simultaneous with it?

As a matter of fact, reference must be made to an event occurring in space, and the positions of the persons in space with relation to the event must be examined. The velocity of sound is a criterion for the determination whether certain sense data experienced by different individuals are to be referred to one single event in the neutral sphere of space-extension and of

¹ Bergson, in his *Durée et Simultanéité*, argues that this order cannot involve real time because it does not refer to conscious experience, but lies outside it. His views on this point are critically discussed elsewhere in this present work.

time-order. Robb, the Cambridge physicist, has asserted that although all events have temporal relations to some events, no events have temporal relations to all.¹ More ordinarily we imagine events to be temporally connective, and fix that relation by a conventional method based on the dissection of a line.

E.g. the event X, if occurring midway between A and C, is deemed to be simultaneous with another event B which we know to be occurring midway between A and C (provided that certain conditions of signalling are observed and that there is no relative motion involved and provided that *light* takes the same time to traverse the distance XA as the distance XC).

Of course, the reliability of such a convention is obviously based upon a supposition about the clocks in both cases. It assumes that the clock in the series, A, B, C, keeps identical time (i.e. goes at precisely the same rate) with the clock where X occurs. Now, unless the clocks can be seen together by one and the same observer (which is unlikely), the only test of their keeping the same rate is by means of signals of light. Their synchronism can only be judged by light-tests. This involves a still further assumption with regard to light, which is singularly important: that velocity must be constant and must be the same in all directions.² We are then involved in a further predicament, for how can we possibly know that the velocity of light is the same in all directions unless the clocks are synchronous? *The velocity of light cannot be measured unless we know the time by clocks in two places.*³

¹ Robb, *Space and Time*.

² The observation of fringe-widths or wave-lengths can be made by the interferometer of Michelson without "clocks", but it can be objected that this instrument is for our purpose a clock. Bergson seems to have this in mind in *Durée et Simultanéité*. He would regard the interferometer as essentially a clock. Similarly an atom with the periodic movements of its electrons is a clock. The Danish Physicist, Bohr, in 1913, applying Planck's Quantum Theory (of 1900) threw new light on the structure of the atom. In 1915 Sommerfeld applied the theory of Relativity to these phenomena, and his results were confirmed by Paschen in 1916 and again in 1917 by Gletscher, one of Sommerfeld's pupils. Bohr believed the electrons revolved round a nucleus in regular periods. He took the movement to be circular, but Sommerfeld showed it was elliptic. The periodic revolution was confirmed, and the work of Rutherford and Astor have made it clearer in detail.

³ The velocity of light, v , was constant for the Pre-Relativists since Römer in a certain absolute sense. Under the Theory of Relativity it is constant for observers moving at different rates.

These two factors stand or fall together, and we are obliged to make the one explain the other—that is to say:

1. If we believe that the velocity of light is constant and uniform in all directions, then we can work by light signals and make our clocks in different places synchronous.
2. If we believe we have established synchronous clocks, we mean that light moves with a constant velocity in all directions. Synchronism in different places, or simultaneity at a distance, we say, implies this, and the measurement of distances implies equally that the velocity of light is constant and the same in all directions.

These conventions we are bound to introduce and adhere to in our calculations. They rest on two facts stressed by Einstein, namely, (1) that light has a finite velocity, (2) that we must ultimately appeal to light signals. Their full significance is only apparent, however, when we consider the relation of events in two systems, one of which is in motion. The motion is in a sense reciprocal, as the relative motion of the two systems to each other is absolutely neutral. Let them be Y and Z. Let Y move away from Z. To the people on Y it will seem that Z is moving away from them. To the people on Z it will appear that Y is moving away from them, i.e. in the absence of any observable third system. It will then be found that because of the relative motion there will arise differences of judgment between the persons on Y and those on Z with regard to events. There will be important differences in regard to matters of fact, affecting both distance-judgments and time-judgments. For instance, lengths along, and at right angles to, the direction of motion within the Z system will seem equal to the people on Z, but will appear unequal to those on Y. Again, events occurring in different places within the Z system, which those on Z assert to be contemporary or simultaneous, will be deemed by those on Y to be successive events.

These considerations, which arise from the work of Lorentz, Fitzgerald, and Einstein, form the basis of the Theory of Relativity (in its restricted form) and serve to show the element

of convention and subjectivity involved in our judgments of distance and of simultaneity.¹ The Theory of Relativity implies the rejection of the Newtonian ideas of space, time, and motion, for none of these can be looked upon as absolute physical reference systems, while an absolute ether, the same for all observers has, in consequence of the Michelson-Morley experiment, been discarded as unverifiable. We have seen how important a part is played by the velocity of light in fixing simultaneity. It is necessary to say something in this connection regarding the famous Michelson-Morley experiment, which preceded Einstein's investigations by many years. The first statements of Einstein regarding his theory appeared in 1907; the experiments of Michelson go back to the eighties of the last century. The Michelson-Morley experiment is the most interesting and crucial of those many experiments which in recent years have led to criticism of the traditional Newtonian conceptions in physics, and have been instrumental in leading on to closer investigations in the direction of the formation of the physical theory of relativity. The work of Michelson, Morley, and Miller is of fundamental importance in this field, for that work began the current of experiments and theories which gave us the Lorentz-Fitzgerald formulae and ultimately the doctrines of Einstein. The whole field of work now covers a period of almost half a century of patient and intensely detailed technical work. The original experiment is of fundamental importance for modern physics, and a clear comprehension of it can alone show us the difficulty inherent in the measurement of time and the bearing of the recent work in physics upon our whole problem, especially the questions of simultaneity and local or multiple times. Moritz Schlick, in his little work on *Space and Time in Contemporary Physics*,² expresses the opinion that "Michelson and Morley's experiment forms the best introduction to this principle (the Theory of Relativity), both historically and for its own sake—historically, because it gave the first impulse towards setting up the Relativity

¹ This physical subjectivity refers to the *position* rather than to the *mind* of the observer.

² *Space and Time in Contemporary Physics*, p. 7. Schlick is Professor of Physics at Rostock. The English translation, with an introduction by Professor Lindemann, of Oxford, is by H. L. Brose.

Theory, and in itself because the suggested explanations of the experiment bring the old and new currents of thought into strongest relief with one another". Eddington remarked to his audience at the Romanes Lecture in 1922: "I fear that some of you must be getting rather tired of the Michelson-Morley experiment; but those who go to a performance of *Hamlet* have to put up with the Prince of Denmark."¹

The details of that now classic experiment we need not here repeat. We are more anxious to bring out its significance in relation to the problem of time-measurement. Readers who desire to refer to its diagrams will find them, together with a short account of the experiment, printed as an appendix to this work.²

II

As a result of this experiment certain important facts about time appear to be established, or, more strictly, certain facts about time-measurement. The velocity of light, on which time-measurement signals are based, must be taken as the same with respect to various bodies, or, more strictly, various "inertial systems". Seemingly paradoxical effects follow with regard to time. These may be expressed as a "dilation" of time, i.e. certain events which on one system are simultaneous, in another are reckoned as successive, and *vice versa*, so that local or multiple times are set up. This occurs if one system be absolutely at rest and all the other systems are in motion relative to it.

Although the facts of the Michelson-Morley experiment tend to show that there can be no absolutely stable point in the universe to which motion can be referred, nevertheless the imagination tends to retain *one* system for reference. The philosophical consequences of this are vital, and we neglect them only at grave peril. For if one system be used as a reference, the measurement of time which results therefrom is different from that of the older physics and much more novel. Simultaneities in one system become successions in another. Such an advance had been made collectively by a number of physicists and mathematicians before Einstein. His genius lies

¹ Eddington, *The Theory of Relativity and its Influence on Scientific Thought*, p. 6.

² See Appendix, pp. 419-28.

in having pushed on beyond this to a General Theory of Relativity in which *no* privileged system can be used or conceived.¹ The strict adherence to Einstein's ultimate doctrines of reciprocal relativity and of generalized relativity is therefore seen to be of primary importance. *The* difference between the two phases of the Theory is that the *Restricted* concerns *uniform* velocities and the *General* *accelerated* velocities and hence, by equivalence, gravitational motions. In reality, as both Bergson and Einstein have in their own way shown, no system of reference can claim to be absolutely at rest, no really stable point can be established. Instead of a system S^1 , which is absolutely motionless, and a system S^2 , which is in real motion relatively to it, we have two systems *both* in mutual relative motion.² It is, of course, open to us to concentrate our attention on merely one of these and to regard the other (possibly the one on which we are situated and from which we make our observations) as motionless. This leads us to adopt quite arbitrarily one system as a "system of reference".

If all movement be reciprocal and relative, and if there be no absolute "at rest" anywhere in the universe, the observer within any system will have no means of knowing whether his system is in motion or at rest.³ But this fact does not in any way interfere with his making it a system of reference. It is important, however, that we should know exactly what it is that we are doing in such a case. For mathematical purposes it is indeed essential that we should select one of these systems as "system of reference", in which case we immobilize it and *conceive* all the other systems as in relative motion in regard to

¹ It can be held that, to some extent, this was inherent in the Restricted Theory by virtue of its *reciprocal* character.

² *Durée et Simultanéité à propos de la théorie d'Einstein* (1922, p. 34).

³ See Maxwell's remark: "The clearer our concepts of space and time become, the more do we see that everything to which our dynamic doctrines refer *belongs to a single system*. At first we might think that we, as conscious beings, must have, as necessary elements of our knowledge, an absolute knowledge of the place in which we find ourselves and of the direction in which we move. But this opinion, which was undoubtedly that of many sages of antiquity, disappears more and more from the physicist. In space there are no milestones; one part of space is precisely like any other part, so that we cannot know where we are. We find ourselves in a waveless sea without stars, without compass and sun, without wind and tide, and cannot say in what direction we move. We have no log that we can cast out to make a calculation; we cannot, indeed, determine the degree of our motion in comparison with neighbouring bodies, but we do not know what the motion in space of these bodies is." (Maxwell, *Matter and Motion*. Italics mine.)

it. Moreover, the *mathematics* will remain the same whether we arbitrarily immobilize one system or take it to be absolutely at rest. Bergson has criticized this by pointing out in *Durée et Simultanéité* that, while the two hypotheses are the same for the mathematician, for the philosopher this is not the case. "For if S is absolutely at rest and all the other systems are really in motion, the Theory of Relativity would involve the existence of multiple 'times', all on the same plane and all real. But if, on the contrary, we place ourselves in the hypothesis of Einstein [*sic*] the multiple 'times' will remain, but there will never be more than one real Time. The others will be merely mathematical fictions."¹

Apart from succession of before-and-after, time cannot be experienced, conceived, or imagined, for time is bound up with the succession of events. Such succession, however, if it is to be time itself and not a mere abstract symbol of it, must be the successive phases "earlier and later" of a duration, for time as a permanent in change and as really experienceable is essentially duration. The question of whether certain symbols, t , t^1 , t^2 , have an intrinsically temporal meaning resolves itself, for Bergson, into the query whether the time-relation they symbolize can not only be measured, but lived or experienced.

When we see a shooting star in the heavens (argues Bergson) we sense a change and are aware of it as taking time. We may divide up its parts afterwards, but we are aware of the movement as a duration, an event in time.² We may measure time by means of movement, but we are then in danger of confusing the spatial line with the motion in time. The supposed instant might be the end of a duration, as the point is the end of a line, but the line is not made up of points or time of instants. The notion of "instant" arises from our conception of the divisibility of space and not of time. Instants and points are but abstractions. Simultaneity of instants is abstracted from the more natural and primary experience we have of simultaneity. Both Poincaré and Bergson apply the term "simultaneous" in its fundamental meaning to two instantaneous perceptions seized in one and the same act of mind, attention determining

¹ Bergson, *Durée et Simultanéité*, p. 34. "L'hypothèse d'Einstein" means the General or Reciprocal Theory of Relativity.

² This point comes up again in special reference to an analysis of our experience in the "specious present" treated in our concluding chapter,

whether we call them two or one.¹ This primary simultaneity is required when we read clocks or note the arrival of signals, and is more fundamental than the simultaneity of Einstein. This must be admitted, but it is useless for timing distant events. Einstein's criterion of "simultaneity" is used for events at a distance, where difficulties of calculation and measurement must inevitably arise in its determination and which must be settled by objective methods.

Real simultaneity, Bergson maintains, must be "experienced", lived. It cannot be arrived at merely by mathematical symbols which are supposed to coincide, or by a supposition in regard to clocks. Clocks, after all, are looked at to determine the "time" of events. To say "what time it is" is to note the simultaneity (or coincidence) *of an event* (either within our inner life or in the world without us) *with* the hands of the clock. This simultaneity is simple and absolute; without it no clocks or appliances of any kind could be read. We may say that simultaneity is an identity between clocks set to one another by means of light signals. This is true, but it reduces itself to greater simplicity when we recollect that the clocks are compared in order to ascertain the time at which events occur, and the relation of the event to the hands of the clock gives us that absolute simultaneity which is intuitive, experienced, sensed, lived. The physicists themselves (Einstein among them) are obliged to note this primary absolute sense of the term, for it is but that identity in time which enables them to note the time of any event at all. The setting of clocks, for instance, involves noting the time of the departure of the light-signal, then the time of its arrival, and finally the time of its return.

We shall suppose two inertial systems, S^1 and S^2 , having the same history, so that one is a counterpart of the other, and we shall assume that they are in a state of reciprocal motion. Let us suppose that certain events, E^1 , E^2 , E^3 , are simultaneous for A in system S^1 . They are grasped by him in a single instantaneous experience.² Now let A attempt to describe events in the system which is *not his own*, namely S^2 , or *vice versa*; let B attempt to give an account of events in the system to which he is external and complications occur. Take A, for

¹ Poincaré, *La Valeur de la Science*; Bergson, *Durée et Simultanéité*, p. 66.

² Similarly B sees as simultaneous, e^1 , e^2 , e^3 , events in *his* system S^2 .

example. He sees within his own system E^1 , E^2 , and E^3 as simultaneous, but by his calculations (taking his own system for system of reference, i.e. immobile) he infers that B, or a supposed B in S^2 , must see E^1 , E^2 , and E^3 as successive, not simultaneous, events. The "distance" between the events will vary according to the relative speed of the two systems. Meanwhile, B in *his* system continues to experience the events e^1 , e^2 , e^3 , as simultaneous. We must note, however, that if he in turn were to attempt to describe what took place in the system to which *he* is external, the same complications would occur: there would be apparent turning of simultaneity into succession. Bergson points out that this "succession" is purely the outcome of calculations; it is not *experienced* by anyone. There are, he claims, two kinds of simultaneity, two kinds of succession, but only one of them is real and absolute and experienced; the other is variable, relative and academic, based on symbols, not on experience, but on convention. This convention may be required by the laws of physics and by the physicist, but it is not required by the philosopher, for he does not make the assumptions in regard to simultaneity which the physicist makes. Indeed, he is able to point out that, if the physicist adhered to the Theory of Relativity, he would see that there can be no privileged system of reference and that he is not entitled, as a *physicist*, to say whether simultaneity or succession is the truer description of E^1 , E^2 , and E^3 .

On the other hand, Bergson's reference to experience is one-sided and confusing. It is the whole group of phenomena which is experienced by A in two systems and by B in two systems. What the Theory of Relativity actually does is to offer a *system of measurement* by which the two apparently discordant experiences may be harmonized and by which we may calculate either from the other.

From our knowledge that sound and light take time to travel over space we make adjustments in our calculations, and from the perceived fact that two of our sensations are simultaneous we do not and cannot conclude that *the events* which caused those sensations are themselves simultaneous.¹ But if our position

¹ If I hear midnight strike and see a planet pass over a star, I do not assume that the event itself occurred at midnight. If I see a flame shoot up on the sun at noon, I know the event occurred eight minutes previously. Again, if I see a flash and hear a sound after it, I *infer* that they took place together as objective events.

with relation to two events, A, B, is such that when at a point X equidistant in space from the places where these events A and B are actually occurring we perceive the events at the same time, then we feel justified in claiming that the *events themselves* are simultaneous, i.e. happening at the same time.

Benedicks, the Swedish physicist, defines simultaneity for distant places by saying that two distant clocks are synchronous provided that their hands are moving as though their axles were connected by one rigid axle consisting of an absolutely solid body.¹ Quite so, but this offers no help in determining the timing of clocks at a distance. For this, signals must be used.

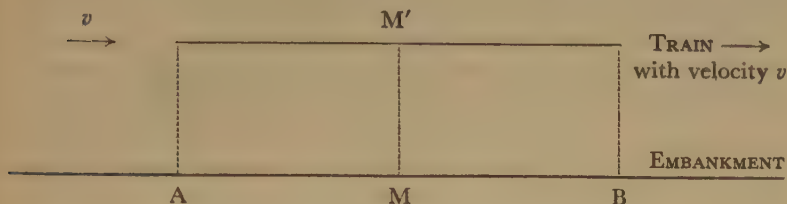
The issue comes to a climax in the treatment Einstein gives to the problem of the determination of simultaneity in his popular book, *The Theory of Relativity*, in the sections on "The Idea of Time in Physics" and "The Relativity of Simultaneity".² Einstein says: "I call two events *simultaneous* for a given observer when they are perceived or seen at the same time by that observer while he is equidistant from both." This, of course, involves, and depends upon, the constancy of the velocity of light—that is to say, its speed must be the same in every direction at all times. This is assumed in the definition of simultaneity, but it is an assumption based on electro-magnetic experiments, and the work of Michelson and Morley particularly.

Both Bergson and Maritain accept this view of simultaneity. They agree that two events are simultaneous for a given observer when they are perceived or seen at the same time by that observer while he is equidistant from both. What they do not agree with is Einstein's view that such simultaneity is relative and not absolute. The complexities of the problem now arise when we endeavour to ascertain whether events which are simultaneous in a given system of reference are also simultaneous in a frame of reference in motion with respect to the first. According to Bergson and Maritain, they are; according to Einstein, they are most certainly not simultaneous.

¹ Benedicks, *Space and Time*, p. 26.

² Einstein, *The Theory of Relativity* (English Translation), sec. viii and ix, pp. 21-7. Born is equally emphatic about simultaneity. "There is no such thing as absolute simultaneity", he says in the section on "The Conception of Simultaneity" in his volume, *Einstein's Theory of Relativity*, p. 196.

Arguing from the definition of simultaneity given (with which his critics have no quarrel), Einstein asks us to consider whether two flashes of light at points A and B on a railway line are simultaneous, and to examine carefully how we



THE TRAIN, THE FLASH AND SIMULTANEITY

ascertain whether they are or not. Applying the definition, we measure the distance A B in a straight line along the railway and determine the point M, half-way between A and B. Here we place an observer, provided with suitable apparatus consisting of two mirrors inclined at an angle of 90° enabling him to see A and B reflected together. If this observer sees two flashes from A and B together, then by definition they are simultaneous events. This is merely an application of the definition. It does not touch the difficulty mentioned, namely that of determining whether events which are simultaneous in a given system of reference are also simultaneous in another frame of reference in a state of motion relative to the given system. To examine this we must introduce in addition to our system of reference (the railway line) another system in motion with it. Let this be a very long train moving along the railway line with a constant speed. Travellers in the train will naturally use the train in which they are seated as their system of reference, and will consider all events in relation to this train. Simultaneity for them will not be *defined* as it is for the railway line. The problem then presents itself in this form: "Are the two events which were simultaneous in relation to the railway also simultaneous with respect to the train?"

Let it be noted that, corresponding to positions on the railway line there will be positions on the train. If A, B and M are railway-line points, then A', B' and M' are correspond-

ing points from the point of view of the train. Now M is midway between A and B, therefore M' is midway between A' and B'. Now the point M' coincides, let us say, with the point M at the moment (with reference to the railway line) when the flashes occur. This presents no difficulty. If the train were stationary the flashes would be simultaneous for an observer at M' as well as at M, for they are the same place. The train, however, *is moving* and is travelling with the constant velocity v . Hence (from the point of view of the railway) the observer at M' (i.e. in the train) *moves to meet* the ray of light coming from B and moves *away* from the ray coming from A. This observer will therefore see the ray from B *before* he sees the ray from A. What matters here, of course, is not the amount of the difference, which would only be appreciable at enormous speeds. The point is that for those in the train the events are perceived, *not as simultaneous*, but as *successive*. The relativity of simultaneity is shown by the fact that events which are simultaneous with respect to the railway line are *not* simultaneous with respect to the train, and *vice versa*. In general terms, that is to say, events which are simultaneous in a given system of reference are not simultaneous in a frame of reference in motion relatively to the first.

To this conclusion of Einstein, Bergson has objected that if simultaneity with respect to the railway is not simultaneity with respect to the train, it is on the condition that a system of physics is constructed from the point of view of the train. We may note that such a system of physics would be one-sided and could not give us that objective reality which is independent of the conditions of the observation and the particular observer. More pertinently, Bergson rightly shows that this involves the idea of a privileged system of reference, against which Einstein's theory is in general directed. Hence Einstein is accused of being anti-relativist himself, and indeed contradictory in his views.

What Einstein proves by the railway train example is merely this. It demonstrates that the observer on the railway line who infers the two flashes simultaneously also sees that these flashes cannot be simultaneous for the observer in the train. Bergson calls the man in the train Paul, the man on the ground Peter, a use of names to which he is rather partial, but which is not

the clearest.¹ For these names we shall substitute George for the man on the ground and Thomas for the man on the train. In these terms Einstein's demonstration of simultaneity proves that George sees the flashes simultaneously, but also infers that these flashes cannot be simultaneous for Thomas. George's reason for such a conclusion is that *he* sees Thomas approaching one ray, and moving in front of the other. George is therefore confident that the perception of the flashes cannot possibly be simultaneous for Thomas. But this is all that the demonstration proves, as Bergson and Maritain rightly maintain. It proves the conclusion of George about what is happening to Thomas. It does not prove what happens to Thomas, and his account of it, which is omitted, is obviously of crucial interest. Einstein has, in Maritain's words, confused the perceptions of Thomas with George's judgment about the perceptions of Thomas, a very different matter. Thus arises what he terms "a kind of intellectual optical illusion". The relativity of simultaneity, as thus demonstrated by Einstein, is a fictitious simultaneity, in Bergson's phrase "a mirage effect". George does not experience what Thomas perceives. For Bergson, the test of time is not measurability or mathematical symbolization, but whether it is *perçu et vécu*, lived or experienced.

The most serious aspect of Bergson's criticism is contained in his reduction of the demonstration of Einstein to an anti-Einstein position. It is one which Einstein must himself reject. But to disprove the truth of a demonstration of the relativity of simultaneity is not equivalent to proving that simultaneity is absolute and not relative. Might there not be, possibly, other demonstrations? It is inconceivable that so exact a thinker as Einstein should be so very inconsistent with his own principles as Bergson has in *Durée et Simultanéité* shown him to be. Light is thrown on the position by the fact that the faulty demonstration criticized by Bergson and Maritain was given by Einstein in a popular exposition entitled *The Theory of Relativity*. His own argued principles, based on careful calculations, appeared in 1905 in a learned German journal on physics and mathematical

¹ Peter and Paul have the same initials, and we can only very arbitrarily relate them to man in train or man on ground. Nordmann improves on this point by calling the train man Thomas and the man on the line Louis (Lewis).

physics, the *Annalen der Physik*.¹ In that authentic, technical, and non-popular account there is no attempt at anything akin to the "railway demonstration" as we may call it. The whole position there taken up by Einstein follows from, and is a natural development of, the work of Lorentz and his equations of transformation, together with the principle of the constancy of the velocity of light, a principle in accord with experimental results. The Lorentz equations arise from the necessity of reconciling new data with the facts of the older physics, and they too express experimental results. These two principles taken together lead necessarily to the recognition of the relativity of simultaneity.

Let us look, however, at the faulty "Railway" demonstration again, for it can be improved. If we arrange for sparks simultaneously at A and B they must meet in M and be simultaneous for George, and they can only meet in one point M. But Thomas is no longer at M but has moved away to the right. The ray from A, however, must arrive at M before it arrives at M', while the ray from B must reach M after it has passed M', so that for Thomas there is not simultaneity but succession. Further, if the train direction were reversed, the succession or order of events would be reversed for some observers. In such a case there must be, as Langevin has argued, an intermediate system for which they are simultaneous. It can be shown that events which are successive for George can be simultaneous for some other system of reference and observation such as the train. If two events close together are not simultaneous for a given observer they may be simultaneous for a certain other observer in motion with respect to the former. This is true when the distance in space between the events is greater than the distance covered by light during the time interval between them.²

Langevin found himself in difficulties in an attempt to present the relativity of simultaneity at a congress of philosophy, and has been adversely criticized by Nordmann on grounds barely adequate.³ Nordmann's book is mainly on the Calendar and

¹ Einstein, "Zur Elektro-dynamik bewegter Körper" in *Annalen der Physik*, Vol. XVII, p. 891 (1905).

² Langevin, *Bulletin de la Société de Philosophie*, January 1912.

³ Nordmann, *The Tyranny of Time*, pp. 197-9, on Langevin's demonstration in *La Physique depuis Vingt Ans*.

Time, but he raises an objection against Langevin's demonstration as inconclusive, which is hardly fair in view of his own treatment. After showing that for an observer in motion two flashes at A and B are not perceived as simultaneous, he states that that observer cannot rightly judge whether they are simultaneous or not because he is not midway between them. This point was not raised in his previous discussion, and there is no evidence to show that either observer *knew* whether he was midway or not. Obviously the man half-way, if he knows he is half-way, can conclude that the events are as perceived, simultaneous (objectively). The other man sees them as successive, but why he should think they are not successive, but simultaneous, is not clear unless he knows his position in space, and this Nordmann is far from definite about. This raises the problem of "perceived" simultaneity and its relation to "simultaneity" as defined previously in relation to equidistance in space. Apart from a knowledge of position in space relative to the place of the events, observers cannot be sure that they know events as they really are happening.

Bergson is not alone in his outspoken criticism of Einstein. Maritain, a French thinker of a quite different type from Bergson, is equally emphatic in his denunciation.¹ For him simultaneity is absolute, not relative. Both these critics are men of no mean achievement in the mathematical as well as the philosophical world. They agree in objecting to the view of Einstein and Langevin, that simultaneity is relative. Einstein and Langevin claim that two events which, for a given observer, take place at the same time, do not take place at the same time for any other observer in a state of motion relatively to the first observer.

Maritain takes up the cudgels strongly against the Relativists. "It is impossible", he argues, "to build up a sane philosophy of nature unless we restore, not against unrelated physico-mathematical sciences, but against the physico-mathematical physics founded by Descartes, the reality of absolute motion." He asks: What right have physicists to undertake, with astonishing presumption, the revision of the common notions of space,

¹ *Nouveaux Débats Einsteinien* (*Revue Universelle*, April 1923). Maritain, it is worth noting, published in 1914 a large work on Bergson, critical in character, *La Philosophie Bergsonienne* (Paris, Rivière).

time and simultaneity, whose elucidation appertains to a superior science which entirely exceeds their competence? That superior science is, of course, for him, metaphysics. The demonstration of the relativity of simultaneity is for Maritain "false coin", and a proof that "a physico-mathematical theory, in itself irreproachable and of immense scientific interest (whatever may be its absolute value), can, as soon as it leaves the domain of purely mathematical symbols, find itself formulated in an incorrect manner, and may thus figure as a pseudo-metaphysics which, though put forward in simplicity and good faith, amounts nevertheless to a poor intellectual buffoonery". The relativity of real time he considers to be an absurdity. The relativity of simultaneity as proved by Einstein is, in his view, a fictitious simultaneity and a fictitious time, and he finds refuge in a point of view akin to Bergson, for whom nothing is real unless perceived. Time is fictitious which is not *perçu et vécu*. This is a purely subjectivist view and makes the psychological supreme over the ontological aspect. Metaphysics is, however, obliged to take a wider view and to shun the danger of the subjectivity involved in a principle which is akin to the classic fallacy *esse is percipi*.

Bergson considers that the paradoxes of Relativity arise because of the necessity in which the physicist finds himself of making calculations and measurements about time and, particularly, about the time of persons, Peter and Paul in two different systems in relative motion to each other. As Bergson puts it: "The Time of Paul is a hundred times slower than that of Peter, but it is time attributed, it is not time actually lived. The time lived by Paul will be the Time of Paul observing and not observed, and will be exactly the same time as that of Peter. We come back, then, always to the same point, namely, that there is only one real Time and the others are fictions. What could a real Time be if it were not a Time which was lived or could be lived? What is an unreal Time that is a fiction if it be not one which can never be really lived by anything or anybody?"¹ The supposed "multiple times" do not interfere with the doctrine of one universal Time; they rather strengthen it and demonstrate it much more clearly than did the pre-Lorentzian mathematical-physics.

¹ *Durée et Simultanéité*, pp. 106-7.

Similarly, Russell says very emphatically in his discussion of *Our Knowledge of the External World*: "The principle of relativity does not destroy the possibility of correlating different local times and does not therefore have such far-reaching philosophical consequences as is supposed. The one all-embracing time still underlies all that physics has to say about motion".¹ Russell, however, as we shall later see, does not throw away objective time as does Bergson, or suggest that objective time is not really time but space, nor does he confuse time with our awareness of it, which Bergson does and so rests in the limitation of a purely mental, subjective time.

Poincaré in his *Dernières Pensées* put the matter concisely: "Le temps psychologique, la durée bergsonienne, d'où le temps du savant est sorti, sert à classer les phénomènes qui se passent dans une même conscience: il est impuissant à classer deux phénomènes psychologiques qui ont pour théâtre deux consciences différentes, ou *a fortiori* deux phénomènes physiques." This is reiterated by Parodi in *La Philosophie contemporaine en France*: "Mais dès lors, comme le temps homogène des mathématiciens n'est qu'un symbole spatial, que seule la durée concrète et réelle, si celle-ci doit être conçue comme, d'un être à l'autre, diverse et hétérogène, on ne voit plus comment peuvent se coordonner, se sérier en simultanités et en séquences objectives les événements de l'univers. N'importe quoi, semble pouvoir être contemporain de n'importe quoi. Ou bien, s'il faut, pourtant, admettre quelque moyen de raccorder

¹ Russell, *Our Knowledge of the External World*, p. 104.

In his latest lectures, *An Outline of Philosophy*, he speaks, however, of there being "no one cosmic time" (Chap. XXVI, "Events, Matter, and Mind"). Elsewhere in the same book (Chap. XV), "Our Knowledge of Physics", he says: "If light traveling from the place of one event to the place of another event has taken place and conversely, then there is no definite objective time-order of the two events and there is no reason for regarding either as earlier than the other, nor yet for regarding the two as simultaneous. Ideally careful observers will judge differently according to the way in which they are moving. This Time is *not* cosmic but to some extent individual and personal for each piece of matter" (pp. 164-5).

"It was [once] thought that the time-order of the two events must always be objectively definite, although we might be unable to determine it. We now find that this is not the case." There are, however, so many matters *we* cannot determine about light that Russell might be accused of dogmatism. Certainly Palágyi is not convinced that the matter is settled and his criticism is serious. It may still be that there is a time relation between certain distant events which *we* cannot determine, and which we never will determine until we know more about light, its nature, and its relation to the motion of bodies.

ces durées diverses, de mettre à l'heure toutes ces horloges que sont les différents êtres, on ne peut pas se passer, comme l'a bien vu M. Berthelot, par delà la durée vécue, d'un temps objectif et mesurable; et ce temps seul nous permettra de comprendre comment la première vibration de la cloche qui sonne, étant vraiment en soi antérieure à la seconde, puis à toutes les autres, a rendu possible la synthèse qualitative que ma mémoire en a opérée; mais c'est cette synthèse alors, qui, dans sa subjectivité même et son essence qualitative, apparaîtra nécessairement relative, individuelle, et, en fin de compte, cessera d'être exacte et révélatrice de la réalité."¹

Bergson's criticism is in terms of psychological or mental time, and although it is inadequate because of its references to the *mind* rather than the *position* of the observer, nevertheless, we may observe in *Durée et Simultanéité* the restatement of the difficulty in which Locke found himself when faced with physical time on the one hand and mental time on the other. For the psychologist, time is essentially the content of the inner sense of sequence and duration, while for the physicist it is the measurable time of the outer world of motion. There are thus two concepts of time, the physical concept and the psychological concept. The metaphysical concept cannot be equated with either, for the metaphysician cannot rest content with such a purely subjectivist view as that of mental time. On the other hand, while sharing with the physicist in objectivity, the metaphysician refuses to accept the physical concept of time, for the physicist limits himself solely to time as measured. The metaphysical concept of Time is based on time as objectively given, for the metaphysician can never equate or confuse time with our awareness of it, as Bergson does. He notes this subjective aspect, but subordinates it to the objective time of which it is an awareness. He refuses to limit his objective interest merely to time as measured, and so erects a concept of time which is based on objective change in the world of events. For the metaphysician, the order, sequence, and duration of events constitute the basis of his concept of time. This point will be raised later in our conclusions on the Nature of Time. Here we are concerned with the objections raised by Bergson to the doctrine of Time in the Theory of Relativity. The

¹ Parodi, *La Philosophie contemporaine en France*, p. 342.

subjective time of which he speaks is a *durée perçue et vécue*, a personal, mental, or experienced time which does not consist of instants, nor can it, as a transition from past to future, exist apart from consciousness (as a complex of memory, percept, and conation). But the distinction between before and after, between the earlier and the later phases of a mechanism, can be made apart from subjective time and, indeed, apart altogether from consciousness, as an implication of the causal sequence of events in nature and the successive phases of a movement, and this constitutes objective time.¹

III

Numerous paradoxes arise from the doctrines of the Theory of Relativity. The noted French mathematician, Poincaré, was fully aware of these and of the relativity principles involved in the measurement of time. How near this great thinker came to announcing the doctrines of The Theory of Relativity himself can be seen in his treatment of these problems with characteristic French lucidity in *La Valeur de la Science*, published in 1905. It was in this year that Einstein formulated his first (restricted) theory. The General Theory, in which accelerated motions instead of merely uniform motions are involved, came later, in 1917.

At the Fourth International Congress, which was held in 1911 at Bologna, Langevin of the Collège de France read a paper on "L'Evolution de l'espace et du temps", in which he showed the philosophical implications of the Theory of Relativity. Langevin demonstrated in a striking manner some of the paradoxes involved in the Relativity doctrine by the famous description of the man in the projectile who left the earth at a speed just a little less than that of light. He was away for two years, but found on his return to earth that not two years but

¹ A critical review-article entitled "Bergson and Einstein" was published by the writer in *The Australasian Journal of Psychology and Philosophy*, September 1926. (Vol. IV, No. 3, pp. 215-18.) See reply to this by E. V. Miller (Dec. 1926). Cf. also Mr. Miller's article "Einstein and Pre-relativity Physics", *The Australasian Journal of Psychology and Philosophy*, September 1928, pp. 184-94, in reply to Mr. Ross's paper in Symposium, *Mind*, October 1920. Miller indicates four implied meanings of "Simultaneity" (see Appendix to this book).

two centuries had elapsed! Langevin's paper at the Congress at Bologna stimulated the author of *Time and Free Will* into a criticism of the mathematical-physical views of Time connected with the Theory of Relativity.¹

Eddington has discussed this problem in his *Space, Time, and Gravitation* by introducing us to an aviator travelling at 161,000 miles per hour, who lights a cigar. We also do so, and the result is paradoxical. The aviator finds our cigar lasts twice as long as his. We find his cigar lasts twice as long as ours.²

The paradoxes are increased if we take cases of an observer moving with a speed greater than the velocity of light (which is 186,000 miles per second). These lead to extreme dislocations of simultaneity and the entire reversal of the objective time-order in perception. Suppose, for example, that an observer be carried away from the earth in the manner of Langevin's man in the projectile, after the fashion of Jule Verne's projectile shot forth from Columbia,³ and suppose that his speed were faster than that of light (say, 400,000 miles per second),

¹ Bergson acknowledges this in *Durée et Simultanéité*, p. 109. This work, published in 1922 and re-issued in an enlarged edition in 1923, is devoted to a critical examination of the problem of time *à propos de la théorie d'Einstein*.

For a critical discussion of Langevin's paradox see the Symposium of the Aristotelian Society and Mind Association, July 1923, *The Problem of Simultaneity*, by Wildon Carr, R. A. Sampson, and Whitehead. Published as Supplement (Vol. III) to *Aristotelian Proceedings*, title: *Relativity, Logic, and Mysticism*.

² Eddington, *Space, Time, and Gravitation*, p. 25. There is a Time Table for this given as follows:—

Stationary Watch.	Stationary Observer.	Aviator.	Aviator's Watch.
Minutes.			Minutes.
0	Lights cigar	Lights cigar	0
30	Finishes cigar	—	15
60	Inferred time Aviator's cigar finished	Finishes cigar	30
It may be completed:—			
112	Receives signal Aviator's cigar finished	—	56
120	—	Inferred time stationary cigar finished	60
224	—	Receives signal stationary cigar finished	112

³ Verne, *A Journey to the Moon*.

then his awareness of events would be indeed strange. He would see the time-order of events on the earth reversed, because during his journey he would catch up successively the waves of light which had left the earth before him. The farther off he catches up to them, then the earlier they will be in history. "After a time", says Nordmann, "our man or superman will witness the Battle of the Marne. He will first see the field strewn with the dead. Gradually the dead will rise and join their regiments and presently they will be seen in groups in Galieni's taxis, which will travel *backwards* at full speed to Paris, arriving in the midst of a population that is extremely anxious about the issue of the struggle, and the soldiers will, naturally, be unable to give them any news."¹ The supposed observer will thus see earthly events as if he were ascending the stream of Time or going back over history in a reverse manner, like the man in Mr. H. G. Wells's novel, *The Time Machine*.²

All these suppositions have been excellently summed up in the one paradox or parody:

There was a young lady of Bright
Whose speed was faster than light;
She eloped one day
In a relative way,
And returned on the previous night.

This arises from the fact that, according to Einstein, there can be no *observed* velocity greater than that of light.³

The view has been put forward that there may be different directions of time-succession. There may be beings for whom Nordmann's account of the Battle of the Marne, already referred to, may be true; the child would be at school before the mating of its mother, a man's death would occur before his birth, as in a reversed film of the cinematograph. These data would be

¹ *Einstein and the Universe*, Nordmann (Astronomer of the Paris Observatory). English translation, p. 77. Flammarion made a similar suggestion in *Lumen, l'Histoire d'une Ame*. The main significance of Nordmann's discussion is its criticism of Flammarion's notion of travelling faster than light. It excellently illustrates why relativist physicists cannot accept a greater *observed* velocity than that of light.

² See also the amusing and more recent work of Pawlowski, *Voyage au pays de la quatrième dimension*, 1923.

³ Actually greater velocities may exist (cf. *Nature*, Vol. CXXII, p. 279).

perceptual, not purely objective. The time-series as we know it is irreversible and would appear purposeless if it were otherwise.¹ The petrol-car had to wait long before coming to effective use, because it was impossible to obtain safe sparking before the magneto was invented. Benedicks considers that formally the events of a system which is not itself the time-measurer may be reversed, but he admits that in nature irreversible processes predominate and the "hands of the clock" cannot be put back. The continual flowing of time in one direction and the second law of thermo-dynamics are only, in his opinion, different aspects of one and the same fact.

The calculating physicist may be confident on his formulae that in a remote system P events can be perceived which are future to those in a neighbouring system P^1 . This is only a manner of speaking due to the same influences which force him to say that there is no observable velocity greater than that of light. What he perceives to be in P^1 in the future of the place P^1 is exactly what he perceives in P in the present of P . The greater the difference in velocity between the two systems the more advanced into the future of the place P^1 appears to be the perceived present of P , but it is always one and the same time and one and the same present. This vision of the "future" is illusory in the very definite sense that it is a false future disguised under a mask, but really a projected present.²

The "contraction" indicated by the Lorentz-Fitzgerald equations has never been ascertained, no matter what material has been employed in the Michelson-Morley experiment. Naturally any measurer used must be equally subject to contraction, but no physical differences have ever been observed even with different materials whose physical contractive powers

¹ See the Aristotelian paper by Inge, *Is the Time-Series Reversible?*; Sinclair, *The New Idealism*, pp. 246-9; Karl Pearson, note on "Reversibility", note vii to *The Grammar of Science*, p. 540, and p. 349 of same book; also our own discussion in last chapter of this work (VII).

² Cf. statement by Dunne, whose problem is of an entirely different nature: "It is worth noting that Relativity admits of 'seeing ahead' in Time in the sense that what is future to Jones may be present to Brown. But it does not admit of an event in the remoter future of Jones appearing to Jones a day or two before an event in his nearer future. And that is our problem." (*An Experiment with Time*, 1927, p. 93.)

would vary.¹ Rice in his *Systematic Treatment of Einstein's Theory*² calls particular attention to this, and refers to the negative results of all optical and electrical experiments to ascertain any mechanical effect produced in the rigid body by motion. In 1903 Trouton and Noble's experiment produced negative results, while the tests of Rayleigh and Brace show that there is no change in actual physical length or, more strictly, in intrinsic length. "It must be remembered that the contraction and retardation do not imply any absolute change in the rod or clock. The configuration of events constituting the four-dimensional structure which we call a rod is unaltered; all that happens is that the observer's space and time partitions cross it in a different direction."³ Such are Eddington's words, although we suggest the omission of absolute as it does not simplify the statement. The supposed contraction to which the Lorentz-Fitzgerald figures refer is a matter of perspective. *The Lorentz-Fitzgerald equations merely interpret the Michelson-Morley experiment if we define distances by the time it takes light to traverse them.* There is really no more truth in contraction than there is in the slowing of time or in the dislocation of simultaneity. When *one* system is taken as that of reference (as in the Restricted Theory) and immobilized, then a perspective based on the difference between the relative motions must be worked out. In a picture we indicate a distant figure of a man as small. This, however, is a very different matter from assigning to him the description "dwarf"—in fact, he is as big as any other man, but laws of perspective make it imperative that he should in the picture actually appear small. Consideration of the perspective and relativity of all the systems compels us to believe in one single Time.

In the Michelson-Morley experiment the lines of light are experienced as equal, but not the lines of the geometrical figure involved. Such shortening of the length of a rigid figure is imputed by the physicists to conditions in another system moving in relation to his own. This explains the supposed triple changes of the "dilation of time", the "dislocation of

¹ Freundlich, *The Theory of Relativity* (Three Lectures for Chemists). Gibson (W. R. Boyce), "Relativity and Real Length", *Australasian Journal of Psychology and Philosophy*, Vol. I, No. 1, 1923.

² Rice, *Relativity: a Systematic Treatment of Einstein's Theory*. 1923.

³ Eddington, *The Mathematical Theory of Relativity*, p. 26.

simultaneity" and the "contraction of length". The Theory of Relativity enables us to harmonize the apparently discordant experiences of observer A and observer B, one in each system, but each observing another system as well as his own, and it enables us to calculate the one from the other. All these multiple "times" are, however, contained in the same actual duration. There is a real Time common to all these mathematical "times". The real observer experiences events and changes in real time as perceived and lived. All the more or less dilated mathematical times are necessitated by mathematical and physical calculation and are based on laws of perspective and calculation. "Not only do the multiple times invoked by the Theory of Relativity not break up the unity of a Real Time, but they imply and support it."¹ The multiple local times are really lines of light, and however "long" they are, they are all contemporary and contained in the same duration.

It is of the essence of physics to reduce everything as far as possible to quantities, to measurement, and in mathematical physics there arises a tendency to identify the actual thing with its measurement.² Hence it comes that the "line of light" at once becomes the measure of time and is taken for time itself. The Theory of Relativity takes as its clock or time-measurer the propagation of light.³ The acceptance of the line of light as the equivalent of time accounts for the dilation of time, the Lorentz contraction, and the dislocation of simultaneity. It also partly accounts for the conception of Space-Time of four dimensions as this is put forward in modern physics.

The notion of time as a fourth dimension was suggested by a friend to D'Alembert as early as 1754 and brought forward by Lange and Lagrange, also by Fechner, who published an

¹ Bergson, *Durée et Simultanéité*, p. 172, and Appendices to 2nd edition.

² The strict physicist does not exhibit this tendency in the way that the mathematical physicist does. Although the same thinker is frequently both physicist and mathematician the two standpoints are not strictly the same. See also Meyerson's discussion in *Identité et Réalité*. Cf. an interesting paper by Brunschwig on "The Relation between the Mathematical and the Physical" (Aristotelian Supplement, Vol. III, *Relativity, Logic, and Mysticism*), pp. 42-55.

³ Remark by Guillaume in *Revue de Métaphysique et de Morale*, and further on this see Dupont's discussion in *La Notion du Temps*.

essay on the subject under the nom-de-plume of "Dr. Mises".¹ After considering life in a two-dimensional plane and then in a three-dimensional, he concluded that a higher dimension must always present itself as a time-succession.² Fechner urged that the third dimension, to a being unable to rise above it in an active intuition and construction, must present itself as a time-succession. A two-dimensional being is able to move and construct freely in a plane world while subjectively (unconsciously) existing in the third dimension. A three-dimensional being is able to move and construct freely in a three-dimensional space while unconsciously living in the fourth.³ The conscious mind of man surveys time in memory and imagination only because it lives in a dimension of reality *still higher* than the time-succession, but one which implies the time-dimension. The analytic succession of time-flow is below the synthetic unity of the ego for which that succession is.

If there were no discrepancy between subjective and objective time, or between the time of the subjective act of perception and time considered as a function of the moving sense-object, no motion could be perceived. The perception of motion involves a certain synthetic view, as we know from the ancient puzzles of Zeno and the modern analysis of Bergson. Mere analysis cannot give us the actual *Perception du Changement*.

In 1887 Hinton published his monograph entitled, *What is the Fourth Dimension?* He there described "a little model system of lines sloping in different directions, but supposedly all connected to a rigid framework". If this framework, with its fixed, slanting lines, were to be passed slowly downward through a fluid plane which stretched at right angles to the direction of the motion, "there would be the appearance of a multitude of moving points in the plane, equal in number to the number of straight lines in the system". If solid threads

¹ Fechner in his volume of collected papers, *Kleine Schriften* ("The Paradoxes of Dr. Mises").

² This idea might, as Eriksen suggests, be pushed further and ally itself with ideas expressed by Von Hügel. For if time is experienced in memory, imagination, and thought, it can only be because the subject lives in a dimension of reality still higher than mere time-succession (*Life, Consciousness, and the Fourth Dimension*, p. 48). Dunne, in his book, *An Experiment with Time* (1927), repeats Fechner's assertion as if it were a novelty, and builds on it an elaborate view of serial time, an infinite regress of Time-dimension.

³ Poincaré makes a similar point. See reference by Benedicks, *Space and Time*, p. 16.

of matter were substituted for the lines, these moving points (cross-sections of the threads) would appear as moving atoms of matter to an imagined two-dimensional being inhabiting the fluid plane and regarding it as all the Space there was. Similar considerations would hold good for an arrangement of four-dimensional threads of matter passing through three-dimensional Space. "Were such a thought adopted, we should have to imagine some stupendous whole, wherein all that *has ever come into being or will come co-exists*, which, passing slowly on, leaves in this flickering consciousness of ours, limited to a *narrow space* and a *single moment*, a tumultuous record of changes and vicissitudes that are but to us."¹

As early as 1901 Palágyi stated his "New Theory of Space and Time", and this was the groundwork of Minkowski's conception and that of the Theory of Relativity.² Much has been made of Minkowski's work in this connection, and certainly he originated the *mathematical* expression of Space-Time, but the doctrine of their union was the work of Palágyi. His view was stated in his seven papers, *Neue Theorie des Raumes und der Zeit*, since reprinted in the collected edition of his works in the third volume entitled *Zur Welt-mechanik; Beiträge zur Metaphysik der Physik*.

The Scholastics and Kant erred, Palágyi affirms, by treating Time and Space separately, for actually "a concept of Space cannot be built up without the help of the Time-concept, and similarly a concept of Time cannot be arrived at without the assistance of the concept of Space. The *Zeitpunkt und der Weltraum*, the *Raumpunkt und der Zeitstrom*, are inter-connected each with each. At a point of time we have all space, and a point in space involves the whole of the time-stream."³ From this he deduces the unity of Space and Time. This is specially seen in geometry. He concludes that every time-point corresponds to a World Space and every space-point to a Time-line. This synthesis, involving as it does the conception of *fließenden Raum* and establishing the unity of Space and Time, will lead, Palágyi affirmed, to a new synthesis, a new

¹ Dunne bases the second part of his work on Hinton's views, but carries them to infinite regress (*An Experiment with Time*).

² Melchior Palágyi was a Hungarian philosopher whose works have been published in German (*Ausgewählte Werke*. Leipzig, Barth, 1925).

³ Palágyi, *Ausgewählte Werke*, Bd. III, *Zur Welt-mechanik*, S. 2.

Weltanschauung. In his later papers (1914 to his death a few years ago) he shows himself a vigorous critic of the Theory of Relativity as formulated by Einstein.

In a later paper on *Die Relativitätstheorie in der modernen Physik*, Palágyi shows how he stated the doctrine of the unity of Space and Time seven years prior to Minkowski's famous Cologne address, although he did not give to it the mathematical expression which Minkowski worked out. Several of his arguments about simultaneity and the nature of time and space anticipate those of Whitehead and of Alexander, and his doctrine of Space-Time is based on less controversial grounds than those of the author of *Space, Time, and Deity*.¹

Palágyi claims that nothing we experience can take place either in Space alone or in Time alone, but only in both Space and Time. For him Space and Time together constitute one single but twofold ordering of the world of phenomena (*eine einheitliche Doppelordnung der Erscheinungswelt*).

Nevertheless, this thinker is very critical of Relativity Doctrines, and he has some special comments on the Michelson-Morley experiment, based upon a sharp distinction which he makes between events. These are of two classes: (a) movements (e.g. rotation of the earth) and (b) propagations (e.g. electricity and light), and the two classes or types of transmutation or change are separate. *They can never be added or subtracted*. This is precisely what was attempted in the experiment. The whole conception of such an experiment was, in Palágyi's view, false. We may add or subtract the speed of trains, to ascertain their rate of passing or overtaking, but there is no sense in adding or subtracting the speed of the earth and the speed of light, they are changes of radically different types.

Palágyi brings out two other distinctions which constitute a further shrewd attack on Relativity. He points out that movement is frequently confused with motion-transference. Bergson touches on the same point. We have, of course, no direct sense of the motion of *our system* (earth). It is moving at a certain rate and it is generally argued, therefore, we *are*

¹ His final fragment, *Die Weltsystem*, shows the great and original grasp of these problems which Palágyi had (*Werke*, Bd. III, SS. 154-81). The problem of Space-Time from the philosophical point of view is discussed in our next chapter in connection with the work of Alexander, Whitehead, and Broad.

moving also at this rate. This will not suit Palágyi, who insists that the earth is moving, but that we are only undergoing motion-transference. We are not in motion in the sense that the earth is, for we are being carried. Relativity theory, Palágyi claims, has been guilty of confusing these two things which, although mutually dependent, are not the same. It has not only, as Bergson has argued, confused movement with motion-transference, but has also confused movement with the perception of movement. Unfortunately our inability to sense motion-transference has given the Relativists a chance of playing upon our ignorance. This ignorance can only be seen in its true light if we go back, as Palágyi urges us, to Galileo or, indeed, Copernicus, and erect not an objectivized theory, which questionably adds together things which cannot be summed in any one algebraic formula, but examine the possibility of a theory of "mechanical perspective".

For Palágyi the time-movement is symbolic and it appears to replace Newton's "absolute movement". He adopts the Newtonian concept of absolute movement, but limits it to the uniform time-flux. On this he bases his later criticism of Minkowski, to which we shall presently refer.

It is, however, through the work of Minkowski that the conception of Time as a fourth dimension has been made prominent in modern scientific thought, and its advance was largely due to him. "Without Minkowski's idea", says Einstein, "the general Theory of Relativity would perhaps have got no further than its long clothes."¹

"Henceforth", Minkowski declared, "Space and Time as independent things must sink to mere shadows, and the only thing which can preserve some sort of subsistence is a kind of union of the two."² These remarks, styled by Benedicks "presumptuous", were among the opening sentences of Minkowski's famous address on *Space and Time*, delivered at Cologne in 1908, shortly before his death.³

¹ Einstein, *Theory of Relativity*. English translation, p. 57.

² Minkowski's address is translated and printed in the collected volume of papers by Einstein, Lorentz, and Weyl, entitled *The Principle of Relativity*, pp. 73-91. Minkowski indicated similar views in an earlier address before the Göttingen Mathematical Society, November 5, 1907 (in *Annalen der Physik*, Bd. 47).

³ Benedicks is a Swedish physicist holding strongly independent views in his subject. See his *Space and Time: an Experimental Physicist's Conception of these Ideas and their Modification*.

The Theory of Relativity is obliged to posit a Space-Time continuum of four dimensions. This is seen by the fact that the square of the distance between two points A and B, referred to two rectangular axes in a *two-dimensional* space, can be expressed in the form

$$(x_2 - x_1)^2 + (y_2 - y_1)^2,$$

where $x_1 y_1$ and $x_2 y_2$ are the distances read along the two axes.

Similarly in a *three-dimensional* space we would get

$$(x_2 - x_1)^2 + (y_2 - y_1)^2 + (z_2 - z_1)^2.$$

Thus we may proceed indefinitely by algebra to indicate the relationship of the two points A and B in a space of any number of dimensions, to "*n*" dimensions, the square of the distance between the two points being given by the sum of *n* squares, each square being that of the difference between the distances of A and B on one of the *n* planes involved in the *n* dimensional space.

The above equations contain no invariant. It was Minkowski who discovered the expression giving the real invariant on the relativity basis which obliges the Theory of Relativity to postulate and utilize a Space-Time of four dimensions. If the points A and B be regarded as places where successive events occur, and if we make our second equal to *c*, our co-efficient becomes unity. If we take a time, T, such that

$$t = T\sqrt{-1},$$

and if we replace *t* by an imaginary quantity $T\sqrt{-1}$ then our fourth square becomes $-T^2$, and we can express the four differences

$$x_2 - x_1, \quad y_2 - y_1, \quad z_2 - z_1, \quad T_2 - T_1$$

if we give Δs as the interval between the points, as

$$\Delta s^2 = \Delta x^2 + \Delta y^2 + \Delta z^2 + \Delta T^2.$$

On this formula *s* can be regarded as a distance or an interval in Space and Time, for the fourth square corresponds to the Fourth Dimension of a Space-Time continuum where Space

and Time are amalgamated. From this we can write down the differential equation

$$ds^2 = dx^2 + dy^2 + dz^2 + dT^2,$$

and finally can express the interval s , a line in both Space and Time (that is, in the Space-Time continuum), as

$$s = \int_A^B \sqrt{dx^2 + dy^2 + dz^2 + dT^2}.$$

Thus the fourth Dimension has to do with mathematics rather than with Time. The equation

$$ds^2 = dx^2 + dy^2 + dz^2 - c^2 dt^2$$

corresponds to the Space-Time continuum mathematically conceived and expressed. It was Minkowski who showed that the Lorentz-Fitzgerald transformation is equivalent to a twisting of a set of four mutually rectangular axes in a four-dimensional space. Three of the axes are the usual ones, while the fourth is

$$cti$$

where t = Time, c = the velocity of light, and i = the imaginary quantity $\sqrt{-1}$. He substituted the imaginary variable $ct\sqrt{-1}$ for the simple variable t . Naturally this is merely a clever mathematical device or artifice. "The non-mathematician is seized by a mysterious shuddering when he hears of four-dimensional things, by a feeling not unlike that awakened by thoughts of the occult." There is nothing occult or mysterious about it, for it is a matter of algebraical expression and we can work out in this way as many dimensions as we please.

The relation of three-dimensional Space and one-dimensional Time should, for the observer of the universe, result in a more concrete view of the world, because a definite filling to Space and Time gives concreteness and reality. But the amalgam arrived at by Minkowski is impossible to conceive of except as a system of mathematics. We cannot realize such a world picture, for in it Time has become mathematically symbolized. The only gain left to us by this subtle reasoning is, as Eriksen points out, a mathematical formula or purely numerical

scheme.¹ Time, as Broad well asserts, enters essentially into the measurement of space distances, but not into the notion of Space as Minkowski would have us believe.²

To say that Time is the Fourth Dimension is to speak of symbolized time and not Time itself. The notion of a temporal flow can never be obtained from the schema of Minkowski.³ The Space-Time of Minkowski and Einstein is but the inevitable outcome of that view of the world begun by Galileo. Time for the mathematical physicist is and must be a measurable time. The physical concept of Time is radically different from the psychological concept. The metaphysical concept of Time, however, cannot be identified with either.

We may here note Palágyi's criticism of Minkowski in his paper (already cited), *Die Relativitätstheorie in der modernen Physik*.

The motion of a material point according to the traditional mechanics is defined through the three equations:

$$x = f(t) \qquad y = g(t) \qquad z = h(t)$$

Minkowski adds to these the time-equation:

$$u = ict,$$

where u is the co-ordinate corresponding to the Time-axis, and i is the imaginary quantity $\sqrt{-1}$.

In this time-equation we have, says Palágyi, the quintessence of the whole Theory of Relativity. How, then, are we to interpret i and c ? The primary function of c , according to Palágyi, is to stand not for the velocity of light, as with Minkowski and Einstein, but for the constancy or uniformity of the flow of Time. As regards i , this factor cannot be intended to indicate the imaginary character of Time, as Time for Physics is essentially objective and real. It can only indicate the essential disparateness of Time and Space and the necessity, therefore, in the physical interest of keeping the spatial and temporal dimensions distinct. Now, argues Palágyi ingeniously, as this is the exclusive function of i , we may just as legitimately qualify the spatial dimension by the i as the temporal, and the equations

¹ Eriksen, *Life, Consciousness, and the Fourth Dimension*, p. 43.

² Broad, *Perception, Physics, and Reality* ("Measurement of Velocity of Light"), p. 363.

³ Bergson, *Time and Free-Will*, p. 83; and also *Durée et Simultanéité*, pp. 78, 85, 86.

for the path of a material point will then be given by the completely equivalent set of equations:

$$ix = f(t) \qquad iy = g(t) \qquad iz = h(t)$$

and the time-equation $u = ct$; or when the uniform linear movement is along the axis of x , by the simplified equations:

$$\begin{array}{ccc} ix = yt & & x = idt \\ & \text{or} & \\ u = ct & & u = ct \end{array}$$

Here the path- and the time-equations simply change places. Now this cannot be, since it is axiomatic that these two dimensions are disparate. We must, therefore, either give up the assumption that the path-equations are linear or the assumption that the time-equation is linear. Now, according to Palágyi, the axiom of the uniformity of the flow of Time prevents us from abandoning the latter assumption.¹

Eddington distinguishes absolutely between the time of which we are immediately conscious and the "time" of physics and astronomy. If, he says, in his *Mathematical Theory of Relativity*, it is found that "physical time has properties which would ordinarily be regarded as contrary to common sense, no surprise need be felt: this highly technical construct of physics is not to be confounded with the time of common sense. It is important for us to discover the exact properties of physical time, but those properties were put into it by the astronomers who invented it".² Eddington admits³ that even in the

¹ The Time-equation must, then, have a linear character, and the x -axis above would, as linear, have to be a time-axis. Hence the so-called uniform, rectilinear motion of a material point in three-dimensional space can never *really* take place, has no dynamical reality, and can be no more than a methodological fiction. The conclusion follows necessarily from the initial assumption that Time and Space are disparate and that the time-flux is uniform. The motion of a material point in three-dimensional space is necessarily non-uniform. But though uniform rectilinear motion in space cannot be real, none the less, in a certain connection and for mathematical purposes it must be treated as though it were. We cannot mathematically account for acceleration except by presupposing uniform velocity. We must, at any rate, treat speed in space as constant for infinitely small durations. It is in a similar spirit that Palágyi insists that in the limit and for mathematical purposes, the "flowing" space, when the time-material is infinitesimal, must be treated as fixed.

² Eddington, *Mathematical Theory of Relativity*. See his earlier remark about fiction which we have quoted.

³ *Ibid.*, p. 39.

physicists' formula t is not always time. It is sometimes an arbitrary name, useful because it fixes a consequential nomenclature of velocity or acceleration. He suggests it may be the symbol in some equations for "curved space-time", which is not an hypothesis but is an equivalent expression of the observed fact that an irreducible field of force is present, as e.g. round the earth.

Time and Space are among the fundamental physical facts yielded by our knowledge of the external world.¹ We cannot rest content with any theory of them which simply takes mathematical equations involving four variables (x, y, z, t), and interprets x, y, z as space co-ordinates and t as a measure of time merely on the ground that some physical law is thereby expressed. This is not an interpretation of what we *mean* by space and time. What we mean are physical facts expressible in terms of immediate perceptions, and it is incumbent on us to produce the perceptions of these facts as the meanings of our terms.² There can be no true physical science which looks first or only to mathematics for the provision of a conceptual model.

The reason that the velocity of light has been adopted as the standard velocity in the definition of simultaneity is because the negative results of the experiments to determine the earth's motion through the "ether" require that this velocity, which is the c of Maxwell's equations, should have this property. Moreover, light signals are our only way of detecting distant events.

Rice, however, notes the possibility of raising philosophical objections to Einstein's method of relating time by light signals. Whitehead is more definitely critical and makes certain objections to Einstein's definition of simultaneity, which he calls the signal theory. This theory, he thinks, exaggerates the importance of light signals and errs by making the very meaning of simultaneity depend on them. "But", objects Whitehead, "there are blind people and dark, cloudy nights, and neither blind people nor people in the dark are deficient in a sense of simultaneity. They know quite well what it means

¹ Cf. Vierordt's remark, "Space and Time enigmas are the highest problems of the philosophy of Nature" (*Der Zeitsinn*).

² Whitehead, *An Enquiry into the Principles of Natural Knowledge*, p. 46.

to bark both their shins at the same instant.”¹ This is the absolute simultaneity which Bergson and Poincaré noted. Whitehead protests that simultaneity is not reckoned as Einstein calculates, and that his calculation is not accurate, for we live in air and not *in vacuo*. The transmission of light is only one from among many kinds of messages which we habitually experience, such as sounds or nerve-messages within the body. Constancy as well as coincidence is necessary for measurement, and Einstein assumes uniformity of conditions for the uniform transmission of light. “*Apart from such pre-suppositions so obvious that they do not enter into consciousness, the whole theory collapses.*” These are strong words from Whitehead. Presumably “the whole theory” here means, the whole theory of simultaneity put forward by Einstein, not the whole Theory of Relativity. The critical velocity c is not, for Whitehead, to be identified with the velocity of light as Einstein claims. “To base the whole philosophy of nature on light is a baseless assumption.”²

In a recent paper at the Sixth International Congress of Philosophy (1926), McGilvary argues that Einstein’s results do not prove that *light* has the constant homogeneous velocity c in both systems, when time is measured by Einsteinian clock-readings thus obtained. His precise objections deserve quotation in full. “Let me illustrate what I mean by a somewhat analogous case. Let four clocks exactly alike be placed, two of them, viz., A' and A'' at point A , and the other two, B' and B'' , at point B . Let a horse and a motor-car be sent simultaneously from A when clock A' is set at zero. When the horse arrives at B let the clock B' be set so that the speed of the horse from A to B shall be q , and when the car arrives at B let the clock B'' be set so that the speed of the car from A to B shall also be q . This equality of their speeds reckoned by clocks set so as to make these speeds equal does not prove that they were running, neck and radiator all the way, neither does it guarantee that on the return trip their speeds will be equal when the speed of the horse is reckoned by the clocks B' and A' , and the speed of the car is reckoned by clocks B'' and A'' , *after* A''

¹ Whitehead comments on this in criticizing Einstein in the treatment of Congruence in *An Enquiry into the Principles of Natural Knowledge*, p. 53.

² Whitehead, *The Concept of Nature*, p. 195.

has been set, on the arrival of the car at A, so that the return journey of the car shall have had the speed q . Is there any way of telling that the relativist has not committed a fallacy similar to that suggested as possible in connection with horse and car? It is only by actual experiment with *light* and *clocks set by light* that the question can be answered. And this experiment has never been made; possibly it may never be made.¹ Meantime the Newtonian looks askance at the relativistic assumption that light has the constant velocity c by Einsteinian clocks."

"But", asks McGilvary, "what of the Michelson-Morley experiment and other similar experiments? Let us for the present assume that these experiments are definitive. What do they prove? The Newtonian may be willing to say that they prove that there is no material ether, and also that every system S of objects, correlatively at rest, has its own space as distinct from the space of some other system S' moving relatively to S. Why may not the spaces of the two systems be metrically isotropic and physically interrelated in the following manner? An electro-magnetic disturbance originating at any point E in S occurs at point E' in S', E and E' being coincident on the occurrence of the disturbance. Let us call E and E' the respective sources of the disturbance, and let the time used be Newtonian. The homogeneous velocity of the transmission of the disturbance is c in each system, the space measurement for this velocity being made from the source in that system. Thus at F ($EF = d$), there is a response to the disturbance at E after time interval $\frac{d}{c}$; and at F', ($E'F' = d$), there is a response to the disturbance at E' after interval $\frac{d}{c}$. Let the lines

EF and E'F' coincide and be parallel to the relative motion of the two systems. The two responses at F and F' are simultaneous, although F and F' are not coincident at the time of the responses; they were coincident at the time of the *disturbance* to which responses are made. In other words, the transmission to any point of an electro-magnetic disturbance at any other point takes place only in the space of the former point, and its transmission in any other space does not concern

¹ Indeed, it might be said, *can* never be made.

the former point. Interferences between transmissions from any disturbance occur only when the interfering transmissions are in the same space, i.e. transmissions in different spaces do not interfere. Hence Michelson's interferometer showed no shift in interference fringes, since it was fixed relatively to the earth and was indifferent to transmissions in the space of the earth's orbit. This hypothesis, very briefly sketched, accords with the phenomena of astronomical aberration and with the shift of spectral lines known as the Doppler effect. Whether it accords with all other known facts of electro-magnetic propagation remains to be ascertained." McGilvary claimed that his intention was merely to throw out a suggestion of a Space-Time in which the Time is single and Newtonian, and the Space is multiple and metrically isotropic, and in which all the definitions are couched in observational terms.

Two physicists have set themselves the task of writing definitely upon Time. Schlick has written an account of the problem in relation to contemporary physics, while Robb, of Cambridge, has essayed to propound his own views in an original manner, which presents extreme difficulty and occasional unintelligibility not only to philosophers, but (we are pleased to add) to physicists themselves.¹ Robb is distrustful of Einstein's treatment of simultaneity and thinks we must reserve this term rigorously for *events at the same place*. In criticizing Einstein's half-way house treatment of simultaneity he takes exception to Einstein's postulation of a clock in order to determine the instant midway between the instants of departure and reflected return of a flash of light. "It does not appear a satisfactory mode of procedure to found a philosophical (physical?) theory upon a complicated mechanism like a clock without any precise definition of what constitutes equal intervals of time."²

Working from the notion of *after-and-before* Robb builds up twenty-one postulates involving four co-ordinates, in which the fourth is Time. He subordinates Space, however, to Time and regards the theory of Space as part of the theory of Time; but he remarks that the elements of time form a system in

¹ Schlick, *Space and Time in Contemporary Physics*. Robb, *Theory of Space and Time*.

² Robb, *Theory of Space and Time*, p. 8. (Physical, rather than philosophical, we suggest.)

conical order, which is rather like explaining Time in terms of Space. Robb, it should be noted, prefers to deal in lines of light rather than in lengths of rigid bodies. In view of Bergson's comments on the Michelson-Morley experiment this is of interest, as well as in regard to the whole controversy about Real Length.

Benedicks strongly supports the theory of Ritz, that light is an emission not a vibration, and urges against Einstein that the velocity of light is not independent of the motion of its source. An acceptance of this would, of course, re-interpret the Michelson-Morley experiment.¹ Eriksen, another Scandinavian writer, supports this. He is not prepared to admit the truth of Einstein's contention that the velocity of light is the highest observable in the universe. The whole issue turns on this. He considers its constancy a weak point in the theory. He suggests that it may be the second highest, but thinks that there must be one velocity greater than that of light because light itself presupposes a real space in which to appear.² The same writer thinks that Einstein dismisses the hypothesis of Ritz too summarily and prematurely in view of the fact that it offers an explanation of the Michelson-Morley experiment. Einstein's explanation is based on the constancy of the velocity of light. It should be borne in mind that all experimental methods of measuring the velocity of light determine only an *average* to and fro velocity, there and back. But if the velocity of light is the same for the observer approaching it as for the observer moving away from it, then light can travel over a greater distance without altering its velocity, which involves an infinite velocity or the velocity of simultaneity. Einstein's theory contains here two ideas, one the notion of a definable velocity as the highest, the other the notion of a simultaneous presence or rest in space in relation to which velocities of motion are indifferent. Eriksen thinks there is something to be said for this view since, according to him, the astronomical investigations of the dependence of the velocity of light on its source seem to be difficult and uncertain.

Criticizing Minkowski's scheme, Eriksen suggests that a *real*, not artificial, union of Space and Time should give us a more

¹ Benedicks, *Space and Time*.

² Eriksen, *Consciousness, Life, and the Fourth Dimension*, p. 161.

concrete view of the universe, not "a mathematical abstraction thinner and more subtle than ever before".¹ The four-dimensional world of Minkowski is only mathematically or quantitatively determinable. Qualitatively it cannot be apprehended. "There is", as Lindemann puts it, "no more intrinsic difference between length and time than there is between length and breadth."² In this scheme every point must be characterized as a "space-time-point" or "world-point", because not only a certain place in three-dimensional space, but also the moment when this place is occupied by the point, is represented by the world-point. The succession in the occupation of places is given as co-existence in a space-time line, a world-line (*welt-linie*) by which the distance in time as well as the distance in space is represented. The difference between the spatial point and the moment disappears, and with it the difference between a distance in space and a distance in time.

It will always be possible to represent movement in a space of n dimensions as form or spatialized time in a space of $n + 1$ dimensions. A curve given in a space of $n + 1$ dimensions is really a curve in n dimensions *being actually traced*.

The actual movement and change of the universe constitutes the ground of Time by giving rise to events. Events are coming into being and passing away. All Time is not "given" at once, for the essential feature of the time-order lies precisely in its succession. We certainly measure time by space, but it is radically different from space, and no phrase like that of Space-Time can make space encroach on what is distinctly temporal, nor can time function as space. In the progress of science greater emphasis is being given to the spatio-temporal aspects of things and less to the qualitative differences. The measurement of time does not give its essence or nature, as Plotinus long ago remarked. This remains a metaphysical problem. Measurement may be made of time, but any measurement will fail to grasp Time itself for it is qualitative, being bound up with actual events and change. The mathematical or the physical concept is not the metaphysical concept.

Benedicks remarks that *time* is the new item which is added

¹ Eriksen, *Consciousness, Life, and the Fourth Dimension*, p. 42.

² Lindemann, Introduction to Schlick, *Space and Time in Contemporary Physics*, p. iv. Cf. Lindemann's paper at 1920 Congress, *Mind*, Oct. 1920.

to the experience of man when proceeding from the sense perception of immutability to the more advanced perception of mutability. . . . "Now time is the variable which we have arbitrarily introduced in order to enable us to compile such different impressions in a systematic way. The first qualitative idea of time is met with in the word *successively* or its equivalent. We say the different impressions given by an event have taken place *successively*. The quantitative idea of time demands the introduction of an auxiliary process presumed to preserve the same character throughout."¹ He rightly claims that the conception of Time has no meaning for a world without change. But he points out as against Einstein, who gives time a validity only in cases where we are able to *measure* time—that, in fact, the conception of Time can be applied in cases where we have no opportunity of determining it physically.²

For purely mathematical purposes the attempt to describe the world in a four-dimensional mathematical scheme is perfectly justifiable and inevitable. It should be borne in mind, however, that the world so described is the world of physics, or we may say the world expressed by the physicist or mathematician after their kind, that is in the only form open to them, the method of formulae, equations, and symbols. These methods raise the profound question whether mathematics is really applicable to the world we know. If it be so applicable it may still be objected that it may be so in its earlier stages, but that mathematics is prone to run into abstraction, and this mathematization *à outrance* is apt to mislead us with regard to the nature of reality. It may not indeed correspond to reality, but be merely a clever, consistent formulation of figures which are, after all, only symbols.

These may seem harsh words to the mathematician and the physicist, but the world as we know it cannot be represented by mathematics and physics alone. Epistemology and psychology are also involved in these problems, and the metaphysician is deeply concerned with the problems of motion, change, space, and time. The physicist and the psychologist are concerned with two aspects. They approach the universe from two different points of view, roughly, although not always exactly,

¹ Benedicks, *Space and Time*, p. 22.

² *Ibid.*, p. 30.

to be distinguished as, respectively, objective and subjective. They may, as the two knights of which legend tells, quarrel as to the nature of the shield of which each sees only one side. It is the duty of the metaphysician to unite and to transcend the distinction of subjective and objective, and to correlate, if he can, the experiences of the physicist and psychologist, to recognize and to make them realize, too, that the ultimate quest is the nature of reality in its broadest and its profoundest sense.

It is interesting to note that at the sixth International Congress of Philosophy which was held at Harvard in 1926, special prominence was given to the inter-relation of physics and metaphysics with special reference to the problem of Time.¹ It is in the treatment of this problem that they approach closely, although we maintain that the preoccupation with *measurement* which characterizes the physicist's treatment helps the metaphysician very little. This is because they possess different interests and different points of view.

Nothing in recent years is more striking than the mutual approach of philosophy and physics in regard to certain common problems. The work of Sigwart, Mach, Maxwell, Faraday, and Poincaré, together with the work of Michelson and Morley, which was followed up by Fitzgerald, Lorentz, and finally by Einstein, Weyl, Born, Broad, Whitehead, and Cassirer, has an important bearing on the problem of Time and has, in some respects, placed it in the fore-front of contemporary metaphysics. Writers like Russell, Broad, and Whitehead show what work can be done on the borderland of philosophy and the frontiers of mathematical physics.² Never-

¹ See the published *Proceedings* (Longman, 1927), Papers by McGilvary, Weyl, Whitehead, Vassiliev (sic), and Mead.

² Einstein, *The Theory of Relativity. Side-Lights on Relativity*. Weyl, *Space, Time, and Matter* and *Das Kontinuum*. Russell, *Our Knowledge of the External World. Principles of Mathematics*. Broad, *Euclid, Newton, and Einstein. Perception, Physics, and Reality. Scientific Thought. Mind and its Place in Nature*. Whitehead, *Principles of Natural Knowledge. Concepts of Nature. Space, Time, and Relativity* (Aristot. Soc., 1916). *The Organisation of Thought* (Aristot. Soc., 1917). *The Principle of Relativity*. Eddington, *Space, Time, and Gravitation. Mathematical Theory of Relativity. The Nature of the Physical World*. Cassirer, *Substance and Function and Einstein's Theory*.

Special mention must here be made of the interesting Symposium on "The Philosophical Aspects of the Theory of Relativity" (Int. Cong. of Philosophy, 1920), by Eddington, Ross, Broad, and Lindemann; pub. *Mind*, October 1920, pp. 415-45.

theless, the concepts of physics and metaphysics are distinct, and this needs to be appreciated, especially in reference to our problem of Time.

IV

No one has seen more clearly the relation of physical concepts to metaphysical problems than the great epistemologist, Cassirer. In 1910 he published his profound study, *Substanzbegriff und Funktionsbegriff*, and in 1921 a supplementary study of *Einstein's Theory of Relativity*.¹ The years between these two publications were those which are characterized by the development of the new theory. Writing in 1910, Cassirer was criticizing with great penetration, from the standpoint of epistemology, the current science of his time, which was still largely dominated by the Newtonian ideas of Space and of Time. He now sees in the Theory of Relativity a completion of his earlier criticism and the realization of certain tendencies in modern physics which he had himself exposed. Cassirer's work is a brilliant attempt to set forth a general *philosophical* theory based on a radically relativist epistemology, from the standpoint of which the Einstein theory is seen as the inevitable outcome of tendencies inherent in the very nature of mathematics and physics. In a sense it would not be too much to say that Cassirer's work stands in the same relation to that of Einstein as that of Kant to Newton. We have already quoted some of his criticism on Kant, on whom he published, some years ago, a critical monograph.² Historically, Cassirer is connected, in spite of his criticisms, with Kant, and there are certain general resemblances in the work of the philosopher of Königsberg and that of the contemporary thinker of Marburg and Hamburg. Both are interested in metaphysical problems and their special bearing on those of the mathematical and physical sciences, but Cassirer's philosophy is devoid of that rigid and mechanical formulation of thought which marred so much of Kant's work. He writes, too, with the advantages

¹ Cassirer's large work, *Das Erkenntnisproblem in der Philosophie und Wissenschaft der neuen Zeit* (3 vols.), began to appear in 1911; the third volume was published in 1920.

² This work, *Kant und die Moderne Mathematik*, has already been cited in our previous chapter on Kant.

of the new science at his hand, while Kant (as Cohen in his studies has shown) was too prone to regard Newton's work as the last word in mathematical and physical science.

It is difficult, as in the case of all great work, to affix any label to Cassirer's philosophy. He is primarily interested in problems of epistemology from the standpoint of logical or critical idealism, and it issues in a positive, dynamic rationalism which has obvious affinities with Plato, Descartes, Leibnitz, and Kant. He realizes, especially in regard to Time, the metaphysical points at issue between the physicist and the psychologist, and he finds a way out of the *impasse* presented by the external and internal aspects of our problem, by taking his stand in neither, but in critical epistemology.

Cassirer is, of course, thoroughly acquainted with the latest physics, and in his work on Einstein shows that he fully recognizes where the tendencies of modern mathematical physics have led. He realizes that the Theory of Relativity seeks to resolve, not only the differences of sensation, but also those between spatial and temporal determinations, into the unity of purely mathematical determinations. He is fully conscious of the implications of Minkowski's work, namely, the reduction of every type of "event" to an expression of four co-ordinates of such a kind that it will be incorrect even to speak of three as spatial and one as temporal; all will be simply co-ordinates of Space-Time.

In this way all differences belonging to spatial and temporal apprehension in subjective consciousness appear to be set aside. Not only do all spatial and temporal values become, as such, blotted out, but all those temporal differences experienced by the perceiving mind, indeed, all difference of direction as past or future, disappear. This conception of the world permits only of such distinctions as a plus or minus sign, arbitrarily defined and fixed as in the case of space alone. In fact, the concept of Minkowski is that of an "absolute" world in which the realm of physical entities and changes is turned from *a process* in three dimensions into *a being or existence* in a four-dimensional continuum, in which time, if it remains recognizable at all, appears in the guise of a variable magnitude associated with an imaginary "ray" of light expressed as a fourth co-ordinate in the value $ct \sqrt{-1}$.

Such a scheme takes no account of the qualitative and subjective experiences of time as an inner sense. "There remains in this formula", as Cassirer says, "nothing of that form of time which belongs to all our experience as such and enters as an inseparable and necessary factor into all its content."¹ Yet we must, with him, recognize that, however paradoxical, or even false, the conception seems from the standpoint of that rich, coloured, qualitative experience which constitutes consciousness itself, nevertheless it does but express the full working of the system of physical and mathematical objectivication at which contemporary science aims. Minkowski's Space-Time world is the direct outcome of a method, the quantitative mathematical method which had its inspiration from Galileo. Cassirer is quite explicit about this, and rightly so. "In the resolution of subjectively experienced qualities into pure objective numerical determinations, mathematical physics is bound to no fixed limit. It must go its way to the end, it can stop before no form of consciousness no matter how original and fundamental; for it is precisely its specific, cognitive task to translate everything enumerable into pure number, all quality into quantity, all particular forms into a universal order, and it only 'conceives' them scientifically by virtue of this transformation. Philosophy would seek in vain to bid this tendency halt at any point and to declare *ne plus ultra*. The task of philosophy must rather be limited to recognizing fully the logical *meaning* of the mathematical and physical concept of objectivity, and thereby conceiving this meaning in its logical limitedness."²

This method is unquestionably valid, but only in its own sphere. The content of physical deductions, Cassirer emphatically asserts, "cannot without falling into the error of a *μετάβασις εἰς ἄλλο γένος* be simply carried over into the language of fields whose structure rests on a totally different principle."³ The concept of Time, for the physicist, is different from that of the psychologist, and this distinction must be recognized by the metaphysician.

It is not a distinction which we owe to the Theory of Relativity; that theory only brings it out more clearly. It was

¹ Cassirer, *Substance and Function and Einstein's Theory of Relativity*, p. 499.

² *Ibid.*, p. 450.

³ *Ibid.*, p. 450.

seen in the work of Galileo and was felt by Locke, as we have shown. Galileo's work was the introduction of mathematical quantitative investigation, and this from the very first involved, the neglect of subjective space and time for the expression of space and time as metrical concepts. The two differ, however, as clearly as the sensation of warmth differs from the measuring number which indicates temperature.¹

There is a distinct contrast between the concept of Time for the physicist and the concept of Time for the psychologist, and even the seemingly common property of "continuity" which the metaphysician may wish to stress only disguises fundamental differences. What the mathematician calls the "continuum", as Cassirer points out, is never the purely experimental quality of continuity, of which there is no longer possible any further "objective" definition, but is a *purely conceptual* construction, which he puts in place of it.² The mathematical physicist acts under the compulsion of his science and its method. The only continuum with which he is acquainted (and to which he attempts to reduce all others) is the continuum of *real numbers*, a purely conceptual construction. Poincaré, too, saw this, for in his work on *La Science et l'Hypothèse* he notes the emphasis which modern science places on the mathematical continuum, and he says, with Boutroux, that it is different from our physical continuum; as for a psychological or metaphysical continuum of experience or of becoming, it is not only distinct from such, but actually, in the character of its method and concept, it leads us away from anything sensuous or perceived or experienced in any way. It is a pure concept divorced from perceptual reality entirely and working supreme in its own sphere. The metaphysician must recognize this fact; he need not lament it, still less should he set up merely in opposition, as Bergson does, a purely experiential, subjective continuity. He must recognize the character of the physical concept of Time, and not criticize it for not doing what it deliberately avoids doing because of its method and growth. Weyl remarks in his work, *Das Kontinuum*, "that what can be found in the intuitive continuum and in the mathematical world of concepts are so alien to each other

¹ Even Mach urged this point and is quoted by Cassirer.

² *Italics mine.*

that the demand that the two coincide must be rejected as absurd”.

We agree that the physical and the psychological concepts are thus distinct, but we do think that Cassirer has rather unwarrantably confused, or blended, the psychological and the metaphysical. In the contrast of the physical concept, mathematical in character, and the psychological concept, purely experiential in character, the metaphysician is not necessarily with the psychologist. In so far as he is a true metaphysician, he will see the inadequacy of the purely subjective and will not simply oppose to the mathematical time the Bergsonian objection that it is not *perçu*. The true metaphysician cannot find in perception an adequate criterion of reality. On the other hand, he will not find it in a mathematical concept which is valid enough for physical science. He must frame his own concept of Time, and it must be one which has its roots in the process or becoming of the universe seen in events or change, and seen objectively. He must not allow himself to get into a dilemma in which he has to choose between an entirely mathematical concept, on the one hand, and an entirely subjective psychological concept on the other. He must objectively regard reality in a way which does not interest the psychologist, but while he looks objectively at the world, he will refuse to formulate a purely mathematical concept in which all qualitative and experiential factors are omitted as unreal. The metaphysical concept of Time is one in relation to which both the mathematical and psychological concepts can be understood after their kind, but they cannot be equated with it. They separately present a false absolute, an abstraction valid within the respective sciences in which they arise, but misleading if in itself put forward as the sole description of reality. The metaphysician is concerned with the whole and he cannot follow either Minkowski or Bergson in their entire assertions. The concept of Time to which metaphysics leads reveals its nature in relation to the events, the change, the history of the world. The metaphysician does not insist with the physicist only on *the measurable*, and so the Theory of Relativity helps him little in his inquiry into the *nature* of Time, nor can he insist, with the psychologist and subjectivist thinker, only on *the perceived*, and so the psychological metaphysics of Gentile or

of the Bergsonian *durée* fail equally to assist him. Both the physical and the psychological are but partial views of the whole, and their being placed in opposition in no way relieves the problem of the nature of Time, but leads to discussions which miss altogether its true nature and discourage the formulation of a truly metaphysical concept.

The problem of time-measurement is, in Cassirer's opinion, the fundamental physical problem of measurement. We cannot measure two periods of time directly and compare them in direct perception, for the nature of time is such that two parts of it are never given at once. "We are thus forced to a conceptual arrangement", he says, "made possible by recourse to the phenomena of movement." For abstract mechanics those times are said to be equal in which a material point, left to itself, traverses equal distances. But no strictly uniform motion is to be found in the field of phenomena, and there always remains a divergence between the ideal and the empirical measure of time. The desired exact measure eludes us and we are forced to more remote intellectual *assumptions*. The emanations of radium and the propagation of waves of light have both been suggested as constant measures of distance. But the real *constants*, Cassirer points out, are not the material measuring rods and units of measurement (whatever character these may have) but those very laws to which they are related, and according to whose model they are constructed.

Motion, from the point of view of the scientist, is only a relation into which space and time enter, and they enter in a conceptual and mathematical, but not a perceptual way. Motion, for science, has to be grasped conceptually. Unity is involved with diversity, identity with change, and this identity is never provided by mere observation, but involves, as Cassirer puts it, "a characteristic function of thought".¹

The Theory of Relativity has its starting-point in the criticism of the concept of Time as current in Newton's views, and from the beginning Cassirer affirms that it extends into the field of epistemology, not merely by its applications and consequences, but by its origin. The new physics presents material to philosophy which involves essentially an interpretation in terms of epistemology. The answers of the physicist are, for

¹ Cassirer, *Substance and Function*, p. 118.

the epistemologist, still questions, and they are questions to be critically examined and interpreted in relation to the whole with which metaphysics deals. When Einstein affirms that his theory takes away "the last remainder of physical objectivity" from Space and Time, this remark constitutes the real problem for the epistemologist, who naturally asks: "What is the character and limits of this 'physical objectivity'?" To this, Planck has neatly replied that everything *that can be measured* exists, and this is, of course, enough for the mathematical physicist. The reply, however, gives to the metaphysician an idea of the limits of such objectivity. In short, he is able to see that the physicist is concerned not with the *nature* of Time in any epistemological or ontological sense, but merely with it *as measured* and expressed in abstract intellectual *symbols*, a very different thing, which leaves the metaphysician with the wider and more fundamental problem of its nature.

The metaphysician has, therefore, to point out that the physicist is not only concerned with the object measured, or not *so much* concerned with the object measured, as with the particular conditions of measurement. He has to offer the warning that each age which has put forward new "measures" for the totality of being and natural process, stands ever in danger of taking what Cassirer calls "these preliminary and relative measures, these temporarily ultimate intellectual instruments of measurement" to be definite expressions of the ontologically real.¹

The classical "mechanical" view of the world held in Newton's day has been superseded now by the electro-dynamic view, and laws which to Newton, Euler, and Kant were impregnable have been revised. Hence contemporary physics, when questioned about its concept of Time, gives the opposite answer to that given by Euler in his *Reflexions sur l'espace et le temps*, issued in 1748 by the Berlin Academy of Science. In this work, which considerably influenced Kant, Newton's concepts of Absolute Space and Absolute Time are looked upon as being not merely fundamental concepts for the mathematical and physical determination of nature, but as the absolute and ultimate physical realities, whose reality cannot be questioned by any epistemological difficulties or metaphysical criticism.

¹ Cassirer, *Substance and Function and Einstein's Theory of Relativity*, p. 358.

Kant believed that he possessed in Newton's *Philosophiae Naturalis Principia Mathematica* a fixed code of physical truth on which he could ground philosophical discussion, but the relation between philosophy and science has since changed, and the Newtonian conceptions have been largely modified or replaced. The concept of "field" appears on the scene since Faraday, and the progress of electro-dynamics as a mediator between "matter" and "empty space". The new physics proceeds neither from the assumption of Absolute Space and Time nor of Matter nor of Force, in themselves, for it no longer looks on Space, Force, and Matter as separate entities or physical objects, but sees them as *functional relations*, which can be differently designated by pure "metrics" according to the system of reference in which we express them.

The absolute Space and Time of mechanics, in Cassirer's opinion,¹ involve the problem of existence just as little as does the pure number of arithmetic or the pure straight line of geometry. Absolute Space and Time arise out of the development of these concepts, and he points to the emphasis laid by Galileo on the fact that the general theory of motion signified not a branch of *applied*, but of *pure* mathematics. They are, in short, ideal constructions. They must not be hypostatized into transcendent things; they are pure *functions*, by means of which an exact knowledge of empirical reality is possible. Such knowledge is not possible at the merely perceptual level of experience; it involves, not sensuous, but logical characteristics. The meaning of these concepts does not consist in their being entirely devoid of relation, but in their removing the necessarily assumed point of reference from the material into the ideal.² "We thus", says Cassirer, following Poincaré, "substitute a more exact measure of time for the not wholly exact measure which the stellar day affords, by taking our stand on the law of the conservation of energy and the law of gravitation. That unit of time is taken as 'absolutely' exact whose application enables us, on the one hand, to avoid contradiction of the theoretical demands of the principle of energy, and on the other hand, to avoid conflict between the secular acceleration of the moon as actually observed and as calculated according

¹ Cassirer, *Substance and Function*, p. 181.

² See Kant's remark quoted in previous chapter.

to the Newtonian law. The system in which we seek our intellectual orientation is no individual perceptible body, but a system of theoretical and empirical rules on which the concrete totality of phenomena is conceived to be dependent."¹ He adds that this interpretation of the concepts of Absolute Space and Absolute Time was first established in its general features by Leibnitz, and followed up by Hertz in his work on *Die Principien der Mechanik*.

The validity of the physical concept does not rest on its content of real *elements of existence* such as can be directly perceived by any sensuous expression, but on the strictness of connection and unity which it makes possible. In his lectures on *Sidelights on Relativity*, Einstein says: "As far as the laws of mathematics refer to reality they are not certain, in so far as they are certain they do not refer to reality."² Similarly Witte writes: "Even Space and Time are only provisional and auxiliary ideas belonging to an untenable conception of the Universe. In reality Space and Time have no existence in an absolute sense."³

"Pure experience", says Cassirer, in criticism of Bacon's doctrines, "in the sense of a mere inductive collection of isolated observations, can never furnish the fundamental scaffolding of physics, for it is denied the power of giving mathematical form. The intellectual work of understanding, which connects the bare fact systematically with the totality of phenomena, only begins *when the fact is represented and replaced by a mathematical symbol*."⁴ It is this, he maintains, which gives us objectivity, this transformation of the impression into the

¹ Cassirer, *Substance and Function*, p. 183.

NOTE.—Some physicists would not agree with Cassirer's statement here about "a system of theoretical and empirical rules on which the concrete totality of phenomena is conceived to be dependent". They would substitute "a system of theoretical and empirical rules by which the concrete totality of phenomena may be adequately described". (I am indebted for this comment to Dr. E. F. J. Love, of the Department of Natural Philosophy, Melbourne.)

² Einstein, *Sidelights on Relativity*, p. 28. The remark recalls Boutroux's arguments about the inapplicability of mathematics to reality. "Mathematics cannot be applied with exactness to reality." "Mathematics and experience can never be exactly fitted into each other." Boutroux, *Contingence des Lois de la Nature*. See discussion on "Science" in the present writer's *Modern French Philosophy*, Chap. III, especially pp. 125-31.

³ Witte, *Raum und Zeit um Lichte der neuen Physik*.

⁴ Cassirer, *Substance and Function*, p. 147 (*italics mine*).

mathematical symbol. It is true, he admits, that the peculiar *quality* of that impression is lost, but all that distinguishes it as a member of a system is retained and brought out, and this gives it rank as an objective apperceptive concept or a true *form* (to use Kant's phrase) of all empirical knowledge in general.

The physicist looks on a world where space is dominant, but for the psychologist time is dominant. The "movements" of the one are sequences of bodies in space, the "movements" of the other are the sequences of elements in mind by the operations of memory, awareness, and anticipation. The sphere of physical motion is important, but equally so is the sphere of mental activity. Movements in the latter are not spatial, they are movements through time. If we could not move about in space it is difficult to see how we would be aware of it as it is; so if we could not move about in time by memory (and anticipation) it is difficult to see how we could be aware of time as it is. Carr, indeed, suggests that memory is not necessary to temporal experience, but it must be pointed out that the absence of memory would deprive us of much that contributes to our experience of time, and although we would be aware of succession it is difficult to see how we could reach any *conception* of Time without memory. "The stone exists in space, but has no consciousness of it because it cannot move but only be moved. The animal exists in time, but has no consciousness of it because it has not developed memory as a free spontaneous self-movement in mental time."¹

There is no antagonism between this movement and our simultaneous advance in time. We, in going back to the past in memory, are going forward in living that mental activity which is present to us. The time in which memory-reproduction takes place is one with the universal time-advance of ourselves and the sphere of physical motions. Mental time and physical time are aspects of one metaphysical Time which is based on events both physical and mental.

The Theory of Relativity suggests the view that while the experience of the subject is absolute for him, it is, nevertheless, subjective and relative from the universal objective and conceptual standpoint. In his *Space and Time in Contemporary Physics* Schlick has taken the view that the time of the relativist

¹ Eriksen, *Consciousness, Life, and the Fourth Dimension*, p. 54.

or the physicist is entirely different from that of the psychologist. They are, he holds, "essentially dissimilar and incapable of comparison with one another", but he adds, "they have, as our experiences teach us, a perfectly definite and uniform functional relation to one another".

Sellien has criticized Schlick in an able essay¹ in which he argues that, although Schlick might be right in claiming that a relativist may still be a good Kantian, yet he, Schlick, has grossly misinterpreted Kant's doctrine by dividing Time (and Space) into two kinds, one "physiologico-psychological", the other "physicological". Sellien claims that Kant's pure forms of intuition were to be understood neither physiologically nor psychologically; he considers the Theory of Relativity to be consistent with the Kantian philosophy. He shows himself markedly hostile to the extreme empirical "positivism" of Mach. For Mach, only elements immediately experienced were real, and these were the sole reality. Sellien suggests that a vein of this positivism has influenced Einstein to a great degree, and has also been a determinant to a large extent of the intellectual position of Gauss, Riemann, Helmholtz, Freundlich and, to a lesser extent, Minkowski. Sellien is, above all, a Kantian, hence his attack on Schlick. His own view is that the doctrine of Kant is in no way inconsistent with the Theory of Relativity, but he, of course, sees that Newton's doctrines are inconsistent with the modern development. After all, Kant's problem was not Einstein's, and in spite of his debt to Newton, Kant's metaphysical work remains, apart from the contemporary changes in physics. As Sellien himself puts it: "In the problem of space-time what we are concerned with are questions of *measurement* and not questions relating to space and time as forms of intuition".²

Cassirer, also, takes Schlick to task for some of his statements about the relation of the concept of Time in contemporary physics to the doctrine of Kant.³ If, with Schlick, one would

¹ *Die Erkenntnistheoretische Bedeutung der Relativitätstheorie*. Published in 1919 in Berlin.

² Quoted from Haldane, *The Reign of Relativity* (italics mine).

³ He also briefly records his disagreement with Reichenbach (whose work, *Die Bedeutung der Relativitäts-theorie für den physikalischen Erkenntnisbegriff*, appeared after his own), with respect to the relations between the Theory of Relativity and Kant's critique of cognition. For further discussions by contemporaries of Cassirer in his own country, see Volkelt, *Phänomenologie und Metaphysik der Zeit*.

call the psychological space of sensation and presentation the space of intuition, and contrast it with physical space as a conceptual construction, no objection could be made against this as a purely terminological determination, but one must guard against confusing this use of the word "intuition" with the Kantian, *which rests on entirely different presuppositions*. When, in the recognition that objective physical time has just as little to do with the intuitional experience of duration as the three-dimensional order of objective space with optical or "haptical" extension, Schlick finds "the kernel of truth in the Kantian doctrine of the subjectivity of space and time", and when he, on the other hand, combats, on the basis of this distinction, the Kantian concept of "pure intuition", his contention rests on a psychological misunderstanding of the meaning of the Kantian concepts. The space and time of pure intuition are for Kant never sensed or perceived space and time, but the "mathematical" space and time of Newton; they are themselves constructively generated, just as they form the presupposition and foundation of all further mathematical and physical construction. In Kant's thought "pure intuition" plays the rôle of a definite fundamental *method of objectivication*; it coincides in no way with "subjective", i.e. psychologically experienceable time and space. When Kant speaks of the "subjectivity" of space and time we must never understand experiential subjectivity, but their "transcendental" subjectivity as conditions of the possibility of "objective", i.e. of objectifying, empirical knowledge.¹

The Theory of Relativity is not a metaphysical doctrine, it is a purely physico-mathematical theory. "This", as Cassirer says, "is the standpoint from which it must be judged, and one does it poor service if one seeks precipitately to interpret its results in purely 'philosophical' or, indeed, in speculative and metaphysical terms. The theory contains not one concept which is not deducible from the intellectual means of mathematics and physics and perfectly represented in them. It only seeks to gain full consciousness of precisely those intellectual means by seeking, not only to represent the result of physical

¹ Cassirer, *Substance and Function and Einstein's Theory of Relativity*, footnote to p. 451. He also refers to Sellien's similar remarks against Schlick in his work *Die Erkenntnistheoretische Bedeutung der Relativitätstheorie*.

measurement, but to gain fundamental clarity concerning the form of any physical measurement and its conditions.”¹

This theory and the physicists’ work generally are concerned with measurement. The doctrine of time in the Theory of Relativity is a doctrine of empirical time, not of pure Time. A strictly empirical view might reject a doctrine of pure Time altogether, but if it be maintained it must be beyond the reach of all concrete problems of time-measurement such as those of the new physics.

The “unity in the determination of time”, of which Kant speaks, “is dynamical only, that is, time is not looked upon as that in which experience assigns immediately its place to every existence, for this would be impossible, because Absolute Time is no object of perception by which phenomena could be held together, but the rule of the understanding, through which alone the existence of the phenomena can receive synthetic unity in time, determines the place of each of them in time, therefore *a priori* and as valid for all time”. And, we may add, for all empirical systems or methods of measurement. In the measurement of time the determination of the temporal positions of particular objects or events cannot be in any way derived from the relation of these phenomena to absolute time, but rather the phenomena must determine their positions in time relative to each other.

The Theory of Relativity does not destroy the unity of time of which Kant spoke. The destruction of a substantial or Absolute view of time only increases our belief in the *functional* unity of all multiple or local times. The dynamic unity of temporal determinations is maintained and verified anew.² The demand for the totality of determinations contained in the new physics shatters every attempt to make one single system of reference to serve as the norm for all the others. The notion of Time, however, still retains its logical universality. Even if,

¹ Cassirer, *Substance and Function and Einstein’s Theory*, p. 409.

² Laue writes: “The boldness and the high philosophical significance of Einstein’s doctrine consists in that it clears away the traditional prejudice of one time, valid for all systems. Great as the change is, there is found in it not the slightest epistemological difficulty. For in Kant’s manner of expression time is a pure form of our intuition, a schema in which we must arrange events, so that in opposition to subjective and highly contingent perceptions they may gain objective meaning (*Das Relativitätsprinzip*, S. 36).

as Cassirer puts it, in order to maintain this logical universality many trusted presentational pictures must be sacrificed, this need not disturb us; it can affect the "pure intuition" of Kant only in so far as it is misunderstood as a mere picture and not conceived and estimated as a constructive method.

Even if it be admitted that, for the physicist, space and time measurements must be considered in common, this does not destroy the fundamental character of Space as co-existence or that of Time as succession. Even Palágyi or Minkowski, who urge that no one has perceived a place save at a time and a time save at a place, cannot destroy by this statement the difference between Space and Time. Although two observers in different systems reckon or measure their times or events to be different, there still is always a series of events for each of them and the continuum of events is discriminated from the continuum which is space. However the spatio-temporal interpretations are calculated, the difference between Time and Space, as such, remains unaffected.¹

All measurement presupposes certain theoretical principles and in them certain features of universality. We do not measure mere sensations or by means of mere sensations. To achieve measurement we must transcend perception by the symbolism of the concept, which is not a mere image or picture of what is given in perception. Vaihinger, Duhem, and Cassirer could all be cited in support of this view. In his work on *La Théorie physique, son objet et sa structure*, the French physicist expressly says on this point: "Les faits d'expérience pris dans leur brutalité native, ne sauraient servir au raisonnement mathématique; pour alimenter ce raisonnement, ils doivent être transformés et mis sous forme symbolique."² Vaihinger, in his quaint work *Der Philosophie "als Ob"*, is equally emphatic about the nature of the concept. He remarks that "the conceptual world is not a picture of the actual world but an instrument for grasping and subjectively understanding the world. . . . The conceptual world", he adds, "is only a secondary product of the real world itself, a secondary or tertiary construction arising in our heads,

¹ On this point see Janet, *L'Evolution de la Mémoire et de la Notion du Temps*, Vol. III (1928).

² Duhem, *La Théorie physique*, p. 322.

a construction which the organic beings of this world develop from within themselves.”¹

It is interesting to note in this connection how Kantian in some fundamental respects is the treatment of Time by Karl Pearson in his classic work, *The Grammar of Science*. Time has no real existence and is defined as our mode of perceiving things. We are expressly told that it “depends upon no external world independent of ourselves”.² There is, however, definite recognition of the distinction between perceptual and conceptual time. Time as a whole, Pearson affirms, is conceptual. He affirms that the future belongs only to conceptual time, the past to perceptual. Quite definitely he rejects the Newtonian notion of Absolute Time as implying anything real. “The absolutely uniform motion by which alone we could reach an absolute measurement of time fails us in perceptual experience. It is, like the geometrical surface, reached in conception and in conception only, by carrying to a limit there the *approximate* sameness and uniformity which we observe in certain perceptual motions. Absolute intervals of time are the conceptual means by which we describe the sequence of our sense-impressions, the frame into which we fit the successive stages of the sequence, but in the world of sense-impression itself they have no existence.”³ Newton’s notion of Absolute Time was akin to this conceptual time, but was purely ideal. For, asks Pearson,

¹ Vaihinger, *Philosophy of “As if”*, p. 63.

² Pearson, *The Grammar of Science* (2nd ed., 1900), p. 184.

In addition to Cassirer and Vaihinger, there are other German thinkers who have devoted attention to Time, notably Volkelt, who, in his *Phänomenologie und Metaphysik der Zeit* (1925), criticizes the purely physical concept and develops an idealist conception related to Personality and the Timeless. Cf. also [Ant]on Marty’s book, *Raum und Zeit* (1916), Cohn’s discussion in *Theorie der Dialektik* (SS. 74–83), and Litt’s *Individuum und Gemeinschaft. Icherlebnis und Zeit*, SS. 74–82. *Die Reziprozität der Perspektiven*, SS. 83–6. *Raum und Zeit im Objektivierenden Denken*, SS. 90–6. Meinong, *Über Annahmen* and *Zur Grundlegung der allgemeinen Wert-theorie*. Dilthey, *Theorie des Geisteswissenschaften*. Also Riehl, Natorp, and Driesch. This last writer remarks: “Einstein’s Lehre ist aus dem Wesen der Zeit heraus ganz und gar unmöglich” (*Relativitätstheorie und Philosophie*, S. 24). In addition there is Brentano, his pupil Husserl, and his pupil and successor Heidegger. Cf. Brentano, *Psychologie von empirischen Standpunkt* Husserl, *Logischen Untersuchungen*, “Ideen zu einer reinen Phänomenologie und phänomenologischen Philosophie” (*Jahrbuch für Philosophie und phänomenologische Forschung*, Bd. i. SS. 1–323) (cf. SS. 161–164), and his “Vorlesungen zur Phänomenologie des inneren Zeitbewusstseins” (*Jahrbuch*, Bd. ix. SS. 367–498 (1928)). Heidegger has a lengthy work “Sein und Zeit” (*Jahrbuch*, Bd. viii. SS. 1–438), and this is inscribed “Erste Hälfte”! It has some affinities with Alexander’s treatment. See our note, p. 257.

³ *Ibid.*, p. 189 (*italics mine*).

how can we measure it if there be nothing given in perception which we are certain flows at a constant rate? Such a concept is a useful shorthand method of description, but he warns us against thinking that there is any uniform notion external to or in the mind itself which can serve as a constant rate measurer. Above all, any concept of Time must not lead us to project the Absolute Time of conception into a reality of perception.

Pearson concludes that Space and Time are not realities of the phenomenal world, but "the mode under which we perceive things apart". They are not infinitely large nor infinitely divisible, but are essentially limited by the contents of our perception. This leads him into an interesting discussion of the nature of the scientific concept in relation to what is given in perception. For him, "scientific concepts are, as a rule, limits drawn in conception to processes which can be started but not carried to a conclusion in perception. Concepts . . . are not asserted by science to have a real existence in or behind phenomena, but are valid as shorthand methods of describing the correlation and sequence of phenomena." From this standpoint, he affirms that conceptual Space and Time can be easily appreciated, and the danger of projecting their ideal infinities and eternities into the real world of perceptions avoided.¹ Hume's treatment of the infinity of extent and divisibility of Time was marred and confused, Pearson points out, by his transition from percept to concept in his arguments.² The distinctions of percept and concept as well as of subjective and objective time must always be maintained.

The difference between the concept of objective time in physics and the concept of subjective time in psychology is stressed in an emphatic manner by Eddington in his discussion of "world-wide instants". "The relativity theory", he states, "recognizes these *world-wide instants* for what they are—artificial partitions constructed for purposes of calculation. I may add that it in no way tampers with the *local instants* which form the stream of our consciousness; it fully recognizes that the chain of events in such a time-succession is a series of an entirely distinctive character from the succession of points along a line in space. *Those who suspect that Einstein's theory is playing un-*

¹ Pearson, *The Grammar of Science* (2nd ed.), pp. 152-91.

² Hume, *Essay Concerning Human Understanding*, sec. xii, pt. 2.

justifiable tricks with time should realize that it leaves entirely untouched that time-succession of which we have intuitive knowledge, and confines itself to overhauling the artificial scheme of time which Römer first introduced into physics."¹

In a symposium on the problem of simultaneity, one of the speakers (Professor Wildon Carr) referred his audience back to the views of Malebranche and of Berkeley in his *Siris*, and asserted that, on the basis of their doctrines, there is really no such thing as magnitude but only perspective. This, as applied to Time, would be interpreted as implying that "Time is not an absolute entity, but a derivative of that perspective which for us as human beings is the consequence of our human system of reference".² Further discussion of this point would lead away from the physical Theory of Relativity into the metaphysical theories of Idealism, reserved for the following chapter.

The physicist and the metaphysician understood "The Real" differently, e.g., *subjectivity*, for the physicist refers only to the *position*, not the *mind*, of the observer.

The Theory of Relativity is mainly conceptual in character, and its character is determined, not so much by the bare nature of experience as given in perception, but by the necessity for intellectually representing and interpreting that experience *in so far as it is measurable*.³ Its concepts are strictly physical, not metaphysical. Perception in itself is never an adequate clue to reality, and hence Time, which is of course a percept, becomes in addition a concept. The consequences of this distinction will be apparent later in our concluding chapter on "The Nature of Time".

Meanwhile we must conclude this chapter by recognizing that the discussion of the *measurement* of time offers little or no clue to its *nature*. This remains a metaphysical problem. We shall, therefore, now turn to an examination of its treatment in recent and contemporary metaphysics.

¹ Eddington, *The Theory of Relativity and its Influence on Scientific Thought*, p. 18 (*italics mine*). In the light of this compare his saying previously cited: "Time as we know it now was discovered by Römer."

² Carr, in Aristotelian Supplementary Volume entitled *Science and Philosophy* (1919). Symposium on "Time, Space, and Matter, are they, and if so, in what sense the ultimate data of science?" pp. 107-8.

³ This view is expressed by Franklin and Campbell in their recent statement that "Time, like temperature, may be only a statistical fact". Janet claims that Time cannot be measured, but his views, being psychological, are about subjective time. *L'Evolution de la Mémoire et de la Notion du Temps*, p. 600.

CHAPTER VI

TIME IN CONTEMPORARY METAPHYSICS

Time a conspicuous problem. Guyau's Monograph. Bergson's emphasis on Time as concrete. His *durée* inadequate. Alexander and Space-Time. Whitehead on Events and Change. Broad's view of Time. Problems of Past, Present, and Future. Russell's views. His insistence on objectivity of Time. Other Realists. The Pragmatists. Strange views of Dewey and Boodin. Pluralists and Idealistic views. The Idealists. Bradley and McTaggart regard Time as contradictory and unreal. Their arguments criticized. Bosanquet on Time and the Whole. Volkelt. Royce and his doctrine of the Temporal and the Eternal. Pringle-Pattison, Von Hügel and Ward on Time and Eternity. Gentile's idealist and subjectivist view. Meeting of Idealists and Realists in Time Problem.

NOTHING is more striking in modern thought than the *rapprochement* between physics and metaphysics, particularly since the eighties of the last century when the Michelson-Morley experiment was performed. Although the standpoints and concepts employed in these two fields are not, as we have just seen, the same, nevertheless certain common points of interest have arisen, and physics is closer to metaphysics than has been the case since the days of Barrow and his great pupil, Newton. This is largely because the new physics having rejected the Absolute Motion, Time and Space of Newton is thrown back to a discussion of its own fundamental concepts. This brings physics to the border-land of metaphysics, and the *rapprochement* centres around Time, hence its prominence in contemporary thought.¹ Current writers on the boundaries of physics and metaphysics all stress the importance of Time. This is seen in the work of Cassirer, and again in Whitehead, Broad, Alexander, and Russell. In the discussion of Time many otherwise divergent strands of thought come to a focus, and as Bosanquet has remarked, the most varying extremes of contemporary realism and idealism come together over this vital question.² The

¹ It must, of course, be borne in mind that the doctrines of Einstein are physical and mathematical, not metaphysical. Also we must not overlook the fact that for the physicist, the main interest in Time is confined to Time as measurable. The problem of its nature remains, as we argued in the previous chapter, a metaphysical problem. This relation of metaphysics and physics, with special reference to the problem of Time, was a subject of discussion at the Sixth International Congress of Philosophy in Harvard, 1926. (Consult *Proceedings*.)

² Bosanquet, *The Meeting of Extremes in Contemporary Philosophy*.

work of these contemporary writers has in this connection much more than a merely historical significance. Their work shows the gradual culmination of a thought-process in which the central importance of Time was the main and in some cases, alas! the only point of agreement.

Yet in spite of the interest recently aroused in the problem of Time, in spite of the wealth of insight, analysis and argument which has been contributed to its discussion in various sections of books and in some highly important articles, unanimity of opinion has not been reached and the problem has been recognized as exceedingly difficult. Dean Inge has referred to the problem as "the hardest in metaphysics", and we know that "from the first dawn of speculation till now, from the time of Parmenides and Zeno to that of Mr. Bradley and M. Bergson, there has been no other problem that has seemed so baffling as that of Time."¹

The concrete view of time and a psychological analysis of the problem have been given special prominence in the work of such writers as Guyau, Bergson, and Ward, while writers on metaphysics such as Bradley, Bosanquet, McTaggart, Royce, Pringle-Pattison, and Gentile have recognized the problem of Time to be a conspicuous one.

The interest in it, from its physical, its psychological and its ontological aspects is a most striking feature of contemporary thought. In spite of the difficulties the problem remains, "the central crux of philosophy",² "a key to many of the great problems",³ and in this opinion the majority of contemporary metaphysicians (whatever their view of Time) are unanimous. It is, therefore, not without reason that we find Alexander remarking in his lecture on *Spinoza and Time*, published in 1921, that if he were asked to name the most characteristic feature of the thought of the last twenty-five years he would answer, the discovery of Time. This he explains as meaning, not that we have waited until now to become familiar with Time (the previous chapters of this present work would disprove that), but rather that we have only just begun in our speculation

¹ Inge, *Philosophy of Plotinus*. Mackenzie, "Notes on the Problem of Time" *Mind*, July 1912, p. 346. Cf. Spengler's reference: "this enigma, puzzling, tempting, baffling."

² Bosanquet in *The Meeting of Extremes in Contemporary Philosophy*.

³ Bergson in *Durée et Simultanéité*.

to take Time seriously as an essential ingredient in the constitution of things and to realize that the world is intrinsically historical, for it is a world of events.¹

I

We have noted that it was in the eighties of the last century that certain aspects of the Time problem in relation to the measurement of objective time were raised by the experiment of Michelson. It was in this same decade that the problem was attacked from an entirely different angle, that of an analysis of subjective time by the young and brilliant Guyau, who passed away in 1888 leaving behind him his manuscript on *La Genèse de l'Idée de Temps*. This work, the first monograph devoted specifically to our subject, was edited and published by his stepfather, Fouillée, two years after Guyau's death, and was reviewed by Bergson in the *Revue philosophique* in 1891. Guyau emphasizes the psychological factors lying at the root of the problem, the conditions of our awareness of change, the operation of perception and the important rôle of memory in relation to the past and of anticipation in relation to the future. He examines cases of false memory and abnormal manifestations of time-awareness. His interest, however, is mainly in the idea of time as a growth of experience, and primarily as the order of our sensations, a view partly reminiscent of some aspects of Locke's treatment. His book forms an important link between Kant's treatment of the subject and that of Bergson. He raises the whole problem from its formal side in which Kant was inclined to leave it, and shows the concreteness of time in our experience. He does not, however, like Sigwart, attack the more objective problem of time and events in the external world.

In an elaborate introduction to this posthumous little work, Fouillée endeavours to show the superiority of Guyau's concrete, psychological concept of time over Kant's *a priori* view of it. Certainly Guyau's work is valuable as a concrete psychological study, but Fouillée misrepresents Kant's treatment on the metaphysical side. It was not the psychological problem of

¹ Alexander, *Spinoza and Time*.

how we come by the concept of time with which Kant was concerned, so much as the fact that time is a necessary form of our intuitions and hence necessarily assumed as *a priori* in the possibility of sensations. While many sections of Kant's treatment of time were, as we saw, unsatisfactory, it is idle to oppose to his views a psychological study of the genesis of our idea of time. We must value Guyau's work, not as a criticism or refutation of Kant's epistemological and ontological work, but as an investigation along another line, a line limited by the psychological view-point.

Guyau opposes the psychology of time put forward by the English associationist and evolutionist school, which regarded the idea of time as responsible for the idea of space. He will not allow space to be regarded as a derivative of time, or time to be regarded as a derivative of space. Each has its own characteristic, and this is so however true it be that we employ one as a means to measure the other.¹ We always measure time by reference to space, but we nevertheless regard it as distinct.

The idea of Time, according to him, has its origin in the manner in which we experience sensations. We come to recognize in these an order of succession, and time is bound up with this succession. The world is seen to be a world of events, coming into being and passing away. The actual present in which we really live and act is midway between the past, a knowledge of which we retain in memory, and the future, which for us is anticipation of action or experience. We misconceive the future if we think of it as "that which comes towards us, it is rather that towards which we go".² The true present is instantaneous, immeasurable, but *our* present, as known in perception, is always a stretch of time, a duration; but this specious present which contains in reality past and present with anticipation of the future, is due to the conditions of our perception and the character of our powers of

¹ Guyau, *La Genèse de l'Idée de Temps*, pp. 75-6. He cites Ribot and Taine in support of his view.

² Ibid., p. 33. Il faut vouloir il faut étendre la main et marcher pour créer l'avenir, l'avenir n'est pas *ce qui vient vers nous*, mais, *ce vers quoi nous allons*. On the status of the Future and its relation to the present, see our later discussion of Dunne. See on this point comments on Dunne and Lotze, in footnote on p. 145, and in Chap. VII.

attention or of desire. In our estimation of time-intervals our interests or desires are more important, Guyau claims, than our attention, which Wundt stresses. The rapid passage of time or its monotonous dragging are subjective experiences which can be explained only by relation to desires or interests.

Time, for Guyau, is not a condition of our conscious experience, as Kant claimed, but a result of that experience. It is not a mere *a priori* form which the mind imposes on sensations or phenomena, but an "ensemble" of concrete relations established between them.¹ It is the concrete order, scheme or organization of the images obtained in our experience. In order, therefore, to understand time we must turn to psychological analysis. He does not say that apart from objective events or change there would be no time, but he does insist that apart from desire and memory we should not experience time. His interest in the problem is subjective rather than objective, but if we recognize this limitation, his psychological analysis is, as far as it goes, valuable. Bergson was stimulated by it to produce his own work, and he has much in common with Guyau.

It is interesting to note, however, that when in his conclusion Guyau does very briefly raise the point about objective time, he makes some remarks which are very much opposed to the ultimate Bergsonian development of the doctrine of Time. Indeed, his closing pages might have been written as a direct criticism of many pages of *Creative Evolution*. After a passing reference to the notion of a mysterious Absolute Time, which he says tends to replace the old notion of an omnipresent Providence,² he says that some have held Time to be the omnipotent and essential factor in evolution and progress. This is the view suggested in *Creative Evolution* and which is expressed in the phrase, "Time is invention or it is nothing at all".³ Such a view Guyau emphatically rejects. Time cannot account, he objects, for evolution, or for the differences or novelty in the evolution of things. Time is only a form of

¹ Guyau, *La Genèse de l'Idée de Temps*, p. 117.

² Newton said this more definitely about Space which he related to his conception of the Deity.

³ Bergson, *L'Evolution créatrice*, p. 369 (English translation, p. 361).

evolution or change. It is produced by the "becoming" of the universe; it does not itself produce that evolution.¹

Time for him is the concrete order of our experiences. Guyau finds the explanation of time in the inner powers of imagination, will, and memory, rather than in the outer world of change and events. He is more concerned with the psychological problem of *how* the idea of time arises in us, that is our awareness of time, than with the nature of Time itself which is a metaphysical problem, involving objective as well as subjective data.

In the interval between Guyau's death and the publication of this posthumous work, Bergson gave to the world his Doctorate thesis, *Les Données immédiates de la Conscience*, better known and better described by its English title *Time and Free-Will*, in which the problem that had been presented independently to the mind of Guyau is taken up in a striking manner. Bergson, like Guyau, is primarily interested in mental time, and he postulates a psychological time which he styles *la durée*, in opposition to mathematical time which he thinks is falsely called "time" as it is in character rather spatial than truly temporal.

Meanwhile, on the British side, thought had been directed to the same problem. Ward had written a long paragraph in 1886 stressing the view of Time as concrete, and claimed with some fairness to have anticipated Bergson on this point of distinction between concrete and abstract time.²

"When", says Bergson (in his endeavour to analyse carefully the distinction between the merely successive and the durational qualities of our time-experience), "we hear a series of blows

¹ Janet makes the same criticism. Time is not creative but Being is. Time is not really destructive, conserving, or creative, and should not be "divinisé" as in Bergson. Cf. Janet, *Mémoire et Temps*, last chapter, pp. 569, 600, 610, 617.

² See Ward's interesting remark and explanation in his *Realm of Ends* (foot-note to pp. 306-7). His noted article, "Psychology", in the 11th edition of the *Encyclopædia Britannica*, was later revised and published as the book *Psychological Principles*. The reference to this point is taken from my *Bergson and His Philosophy*, in which, in the chapter on "Time—True and False", sympathy is expressed with Bergson's view. From this I departed in a critical article on Bergson in the *Australasian Journal of Psychology and Philosophy* in 1925. There, as here, Bergson's view of time is condemned as subjective. Cf. also in same *Journal* (1926) my critical review-article on *Bergson and Einstein*, reviewing *Durée et Simultanéité*.

of a hammer the sounds form an indivisible melody in so far as they are pure sensations, and here again give rise to a dynamic progress; but knowing that the same objective cause is at work, we cut up this progress into phases which we then regard as identical; and this multiplicity of elements no longer being conceivable except by being set out in space—since they have now become identical—we are necessarily led to the idea of a homogeneous Time.”¹ Kant’s great error, so Bergson argues, lay in his accepting the Newtonian conception of Time as merely a homogeneous medium. According to Bergson’s analysis, we must not regard Time as homogeneous. Pure homogeneity belongs to Space. He argues this point at some length.

Our ordinary conception of Time, that which comes to us from the physical sciences, is, he maintains, a false one. It is false because so far from being temporal in character it is spatial. We look upon Space as a homogeneous medium without boundaries; yet we look on Time, too, as just such another medium, homogeneous and unlimited. Now here is an obvious difficulty, for since homogeneity consists in being without qualities, it is difficult to see how one homogeneity can be distinguished from another. This difficulty is usually avoided by the assertion that homogeneity takes two forms, one in which its contents co-exist and another in which they follow each other. Space, then, we say, is that homogeneous medium in which we are aware of side-by-sideness; Time is that homogeneous medium in which we are aware of an element of succession. But surely we are not entitled to maintain this, for we are then distinguishing two supposed homogeneities by asserting a difference of quality in them. To do so is to take away homogeneity. We must think again and seek a way out of this difficulty. Let us admit Space to be a homogeneous medium without bounds. Then every homogeneous medium without bounds must be Space. What, then, becomes of Time? for on this showing, Time becomes Space. Yes, says Bergson, that is so, for our common view of Time is a false one, being really a hybrid conception, a spurious concept due to the illicit introduction of the idea of Space, and to our application of the notion of Space

¹ Bergson, *Les Données immédiates de la Conscience*, pp. 94-5 (English translation, p. 125).

(which is applicable to physical objects), to states of consciousness to which it is really inapplicable. Objects occupying space are marked out as external to one another, but this cannot be said of conscious states. Yet, in our ordinary speech and conventional view of things, we think of conscious states as separated from one another and as spread out like "things" in a fictitious, homogeneous medium to which we give the name Time. Bergson says, "At any rate, we cannot finally admit two forms of the homogeneous Time and Space, without first seeking whether one of them cannot be reduced to the other. Now, externality is the distinguishing mark of things which occupy space, while states of consciousness are not essentially external to one another, and become so only by being spread out in Time regarded as a homogeneous medium. If, then, one of these two supposed forms of the homogeneous—viz., Time and Space—is derived from the other we can surmise *a priori* that the idea of Space is the fundamental datum. Time conceived under the form of an unbounded and homogeneous medium is 'nothing but the ghost of Space haunting the reflective consciousness'".¹ Bergson remarks that Kant's great mistake was to take Time as a homogeneous medium.² But, in his insistence upon *la durée*, that "wholly qualitative multiplicity, an absolute heterogeneity of elements which pass over into one another", as real time and as pure heterogeneity, Bergson falls into the opposite error. Pure heterogeneity cannot be grasped any more than pure homogeneity. Heterogeneity he regards as the very ground of our experience, but this is not entirely true. We could not conceive of homogeneity or of simultaneity, or, indeed, *know* heterogeneity, were it not for the contrast in our perceptions between the permanent and the changing.

"Whilst I am writing these lines", he remarks in *Time and Free-Will*, "the hour strikes on a neighbouring clock, but my inattentive ear does not perceive it until several strokes have made themselves heard. Hence, I have not counted them, and yet I only have to turn my attention backwards, to count up the four strokes which have already sounded and add them

¹ Bergson, *Les Données immédiates de la Conscience*, p. 75 (English translation, p. 98).

² *Ibid.*, p. 178 (English translation, p. 232).

to those which I hear. If, then, I question myself carefully on what has just taken place, I perceive that the first four sounds had struck my ear and even affected my consciousness, but that the sensations produced by each one of them, instead of being set side by side had melted into one another in such a way as to give the whole a peculiar quality, to make a kind of musical phrase out of it. Otherwise than by a process of addition, and without bringing in the image of a juxtaposition of distinct terms, the number of strokes was perceived as a quality and not as a quantity. It is thus that real Time (*la durée*) is presented to immediate consciousness, and it retains this form so long as it does not give place to a symbolical representation derived from extensity", that is to say, a mathematical, bare, symbolical homogeneous form. Absolute Time or Mathematical Time is an abstraction of pure succession alone, the durational elements of our concrete experience being omitted. It is a mere procession of positions, instants, moments, and points, and just as a point has no magnitude, so the mathematical instant has no duration, and it is consequently impossible to get included in this abstract conception of Time anything which is even remotely akin to the richness, the concreteness of our enduring experience of Time.

But as we stated in dealing with Kant, Bergson's argument is unconvincing and arises from a predisposition to dismiss objective time as space. He unwarrantably refuses to recognize time as an extensive magnitude at all. Thus, leaving objective time on one side, he is at pains to give us an analysis of time as lived by conscious beings. He does not face the dual recognition in the way that Locke did, of mental and physical time. He simply ignores objective time and dismisses it as "spatial", a grave error. The result is that he really discusses our awareness of time rather than Time itself.

He distinguishes sharply between time as experienced and clock-time. As measurement the latter is valid; as a substitute for time experienced, enjoyed, lived, it is radically false. Bergson insists on the absolute reality of change. We can only understand movement and change by grasping it in essence, claims this modern Heraclitus. Zeno's puzzles arose from the omission of the essential feature of the case, the continuous movement which cannot be reduced to terms of anything else,

or conceived as made up of stages.¹ But change involves an objective world and objective time, which Bergson neglects and rejects. No writer has done more to bring out the importance of the psychological points involved in our *awareness* of time. On the other hand, Bergson himself appears to be very faulty in his treatment of Time. He is *too* much an adherent to the purely psychological position. He is too wedded to his conception of *la durée* to recognize physical time at all. This lays his position open to a very serious charge of ultra-subjectivity.

The delight of being in *la durée réelle* is exquisite, and mystics and lovers of all times have indeed thought so, but it may be well doubted whether this is experience of Time at all. Rather is it the mind working absolutely away from successiveness to the apprehension of an abiding or enduring simultaneity or now in which the mind becomes indifferent to the passage of objective time. The shrewd analysis of *la durée* is certainly true of some of our experience, but our normal lives are not, and cannot be, lived in such pure duration; we are, and have to be, governed by clock-time, by a common neutral time constructed by general agreement with a system of reference, the sun.

This Time, it may be said, we are aware of externally, for it is objective in character. We have constantly to adapt ourselves to it, sometimes irksomely, unwillingly. But Time and Tide wait for no man. *Nolens volens* we are obliged to recognize Time as going on independently of us. This external Time we may contemplate, but this does not make it Space, nor is it any less Time because it is not the creation of our minds. In *la durée pure* the mind weaves its own time. If, with Alexander, we call external Time, "contemplated" and Bergson's *durée* time "enjoyed", it may be added that the time which the mind enjoys is the sequence or endurance of its

¹ The puzzles of Zeno about time and motion arise, according to Bergson, because the intellect is cinematographic in its operations. "The truth is that mathematics deals and can deal only with lengths. It has, therefore, had to seek devices, first to transfer to the movement, which is not a length, the divisibility of the line passed over, and then to reconcile with experience the idea (contrary to experience and full of absurdities) of a movement that is a length, that is, of a movement *placed upon* its trajectory and arbitrarily decomposable like it." Bergson, *Evolution créatrice*, p. 337 (English translation, p. 329). See also Bergson's two lectures, *La Perception du Changement*. Cf Ward's remark: "An interval of time is not the same as the experience of duration", *Realm of Ends*, p. 315.

own events. It is "the murmur of its own inner life", Bergson tells us. Precisely, and we owe a debt to him for his penetration and revelation of it, but because Time is bound up with events, and as events in the mind are not the only events, then Time must have a wider significance than the subjective *durée*; it must include time contemplated no less than time enjoyed.¹ Indeed the time enjoyed by any mind or minds must fall within the Time contemplated by others, and can therefore never entirely lose its relation to measurement indirectly, or to external Time. The experience itself viewed from within may be complete *enjoyment*, but it is an enjoyment by the mind, not so much of Time, but of itself and its content of ideas, images, and feelings.

There is an inconsistency in Bergson's view of the relation of past and present. He says in *Matter and Memory*,² "as the past grows without ceasing so also there is no limit to its preservation. The past is essentially that which acts no longer";³ but in *Creative Evolution* he tells us that "it is with our entire past including the original bent of our soul that we desire, will, and act".⁴ He so mixes consciousness of Time with Time itself that he blends together the past as remembered with the past itself. Hence his repeated references to the past are really references to "our" past (as remembered) rather than to "the" past. This distinction is highly important in the discussion of Time. Its omission involves the confusion which has been so mischievous in philosophy between the psychological and the ontological aspect of a problem.

For Bergson, the Absolute is that peculiar form of Time which he styles *la durée*, and in his *Evolution créatrice*, he gives a wider and more universal significance to the psychological time so much emphasized in his earlier *Essai sur les données immédiates de la conscience*. He makes *durée* or real time the dynamic of the evolution process in direct opposition to Guyau's definite conclusions on this point. *Durée* is graphically described

¹ In place of time "contemplated", we should, perhaps, more strictly say Time "assured" in view of Alexander's discussion in *Space, Time, and Deity*, Vol. II, p. 37.

² Cf. Comment by Fawcett, *The World as Imagination*, p. 253. This writer asserts: "Time-succession is one of the inventions of creative evolution." *Divine Imagining*, p. 57. "Time-succession is the Form of Creation." *The World as Imagination*, p. 242.

³ Bergson, *Matter and Memory*, p. 74 (English translation).

⁴ *Creative Evolution*, p. 6 (English translation).

as that "continuous progress of the past which gnaws into the future and swells as it advances". This creative advance is not, however, adequately or correctly described as a progress *of the past*. In this, Bergson endeavours to give an air of "objectivity" to his *durée*, but he cannot escape the subjectivity which, as we have already noted, marred his previous treatment. For him, Time is not objectively given, it is only Time if we are aware of it. But there is an objectivity about Time. We do not create it, for it is there, and our awareness of it does not make any difference to its existence. We may know time, but we do not become it. His *durée* is an inner preoccupation of the self with itself and its own states, not with time. Lastly, Evolution, as Guyau urged, must be regarded as a temporal process, but not a process generated by Time. Bergson urges that a "Time which does nothing is nothing",¹ but he forgets that things, events, and time are given together, and we can even say events are the interactions of things. Time does not create the things or the events, it is given with them, an essential feature of their happening, but not the cause of their happening. Yet his philosophy of evolution presupposes objective Time, and he fails to see that objective Time may exist and yet be distinct from Space. This is his main error in regard to Time, and arises principally from his rejection of time as a quantitative magnitude.² He confuses Space and objective Time and he, as it were, compounds Time with consciousness to give us his conception of *durée*, which, valuable in some respects within the sphere of the individual consciousness, tends to be misleading when identified with the growth of the Absolute itself. Consciousness is not Time, but Bergson's philosophy confuses Time with our awareness of time. In spite of his repeated protests against Kant, Bergson's *durée* is really the glorification of time as "inner sense", and is marred by the very subjectivity which we found in Kant. Bergson exaggerates it and erects it alone into a

¹ Bergson, *L'Évolution créatrice*, p. 369 (English translation, p. 361). "Le temps est invention ou il n'est rien du tout."

² See Perry's objection on this point in a subsequent section of this chapter. Litt, in his *Individuum und Gemeinschaft*, in his section on Time (Zeit und Raum im Objektivierenden Denken), also criticizes Bergson's Theory of Time, SS. 92-3. See also criticism of Bergson by Janet (who himself deals with the psychological problem), *L'Évolution de la Mémoire et de la Notion du Temps*, p. 600.

system, whereas Kant, for all his insistence upon time as "inner sense", had other and sounder considerations in mind which prevented his doing any such thing. By thus equating our knowledge with existence, Bergson precludes any discussion of time as objectively given and reduces us to the narrow limits of subjective idealism, which he disguises from us by endeavouring to make an absolute of *la durée*. It is however, only a disguise, and he never overcomes the limitation of regarding Time as purely "inner sense", or the initial confusion of identifying Time simply and merely with our awareness of time, an identification which is quite unwarranted, mischievous and fallacious.

II

We have already noted the stress laid by Alexander on the importance of time as a central problem in recent and contemporary thought. "To realize the importance of Time as such is", he remarks, "the gate of wisdom."¹ As a matter of fact, few thinkers apart from Bergson have insisted so much upon this question as Alexander. The lecture (*Spinoza and Time*) from which the earlier quotation was taken was delivered before the Jewish Historical Society in London in 1921, and was devoted to showing how Spinoza had overlooked the importance of Time and how his system could have been improved by bringing the factor of Time into it.² In the closing pages of his Gifford Lectures on *Space, Time, and Deity* Alexander also refers to this neglect of Time in the philosophy of Spinoza, and holds it accountable for some of the speculative difficulties in which the system of this thinker is involved. "For Spinoza", he says, "infinite Space is an attribute of God and Extension is part of God's constitution. But the other attribute which our minds can know of God is not Time, but Thought. Hence, since Time is not an essential part of God's constitution no satisfactory account can be given of how finite things come into existence. We understand why they are resolved into God, but

¹ *Space, Time, and Deity*, Vol. I, p. 36.

² We also insisted on this in our discussion of Spinoza in Chapter III. See also reference to this lecture made in Preface of present work.

not how they issue from Him. God is the reason or ground of finite things, but causality in the proper sense, which requires time, subsists only in the concatenation of finite things with one another, not in their relation to God. Whereas, if in this scheme we substitute Time for Mind, the world of finites arises out of the mere restlessness of Space-Time." Mind, of course, then becomes nothing but a finite of a particular empirical rank, or as Alexander has himself phrased it in another place, "Mind is merely one in a democracy of things."¹ This is his realist philosophy, but the point here to be stressed is that although he admires many things in the system of Spinoza, he thinks it fails largely because of the non-recognition of Time. Alexander takes this occasion to point out how much other systems could be likewise improved by a recognition of Time, for example, that outlined in Plato's *Timaeus* or Kant's *Critique of Pure Reason*, where, instead of being contributions of the mind and forms of sense, Space and Time should be constituents, *a priori* constituents, of things. Because Plato, Spinoza, and Kant failed to take Time seriously they missed the straight and narrow path on which lies what he styles "the gate of wisdom".

Alexander's own view of the problem is contained in his Gifford Lectures, *Space, Time, and Deity*, one of the greatest contributions to philosophical thought made in Great Britain in the present century. Like Palágyi, he treats of Space and Time as a unity, but the term *Space-Time* involves much more than Space *plus* Time. Alexander's doctrine of Space-Time, being based on, or at least allied to, certain statements of Minkowski, and later physicists, as well as allied to the Bergsonian treatment, may well serve not only to indicate the importance which the problem of Time is assuming in contemporary metaphysics (both idealist and realist), but to reveal certain aspects of the problem peculiar to itself. His work stands nearer to the appreciation of objective time than that of Bergson. Alexander has not forgotten the twin aspect of the problem presented by Locke. His own attempt at solution is a piece of brilliant speculation, but is full of difficulties, because this formal Space-Time is so much *more* than Space and Time together.

¹ Alexander, *Space, Time, and Deity*.

Alexander considers that Time as a whole and in its parts bears to Space as a whole and its corresponding parts a relation analogous to the relation of mind to its equivalent bodily or nervous basis. Time is the mind of Space, and Space the body of Time. Space and its Time are not two things, but one, and there is no Space without Time, nor Time without Space. Space does not exist of its own right, and Time is not a new quality which emerges from Space. Time or Space only exists with the existence of the other.¹ The fundamental simple basis of the universe is the unity Space-Time. Time is continuous duration and succession, but it owes its continuity to its union with Space. "If Time existed in complete independence and in its own right there could be no continuity in it", asserts Alexander.² We have, as he points out, no sense organs for Space or Time, "we only apprehend them in and through our sensible apprehension of their filling. Through sense, if not by sense, we become aware of time and of space, or of definite times and spaces, limited and finite in character. But we do not rest there, the mind from perception goes on to conception and constructs an infinitely extended and infinitely divisible Time and Space by powers of imagination, synthesis and intellectual analysis. The concept of Time thus displays Time as infinitely extended, as infinitely divisible and continuous in character. The recognition of the element of continuity saves us from false abstractions about instants which may be legitimately spoken of provided," says Alexander, we never forget the element of continuity.³

Physical time is based on the fundamental feature of before-and-after, i.e. the succession of events, while mental time is based on past-present-and-future, which arises from the relation of events to a perceiving mind. Both times are, however, terms or parts of one Time. "Mental time, the time in which the mind lives its life, or minds its mind, is a piece of the Time which physical events occupy."⁴ While Space has three dimensions, Time, according to Alexander, has three features: (1) duration in succession (he appears to regard duration as

¹ Alexander, *Space, Time, and Deity*, Vol. II, pp. 38-45.

² *Ibid.*, Vol. I, p. 45.

³ That, of course, was Zeno's error.

⁴ Alexander, *Space, Time, and Deity*, Vol. I, p. 93.

more fundamental than succession), (2) irreversibility, and (3) transitiveness. It may be noted that while Kant kept Space and Time as two forms he did not attempt to blend them as Palágyi did, or as Alexander, influenced by Minkowski, has attempted to do.

This "purely metaphysical analysis of Space-Time on the basis of ordinary experience is in essence and in spirit identical with Minkowski's conception".¹ He makes reference also to both Einstein and Langevin. In a special supplementary note to Chapter VIII of Book III, in the second volume of these lectures, Alexander deals with the question of the possibility of many spaces and many times. In this note, partly written as a reply to Bradley's view of Time as an appearance and not a reality, Alexander declares that multiple spaces or times are still portions or perspectives of one Space-Time, and he ridicules the discussions of reversibility which are merely hypothetical and can only be raised as an abstraction which is fanciful and futile. A forward movement of Time is nothing by itself, yet it is only such a Time which is declared to be reversible. Concrete events cannot be turned backwards without altering their spatial relations as well as that evolution of the universe which has determined their order in the manner they have occurred. "Of course, for two individual observers events may occur in the reverse order, the one may hear before he sees, the other see before he hears, but this is a reversal of the order of experiencing and not of that of the events experienced; and further, to each observer, no matter in what order his experiences occur, the order of the objects is irreversible—in fact, we discover the true order of events by making allowance for these subjective variations."²

The time-series possesses a certain order or transitivity, a unique *sense*, asymmetry or irreversibility. The series of events in Time, or any series of events in Time, have a certain direction. Actually, the young lady of Bright elopes one day and returns on a subsequent day, not on the previous night. The

¹ The quotation (*Space, Time, and Deity*, Vol. I, p. 92) is from Langevin's paper, "Le Temps, l'Espace, la Causalité et la Physique moderne", in the *Bulletin de la Société française de Philosophie*, January 1912. We have already referred to it in the previous chapter as having been given at the International Congress at Bologna and having aroused great interest by its paradoxes.

² Alexander, *Space, Time, and Deity*, Vol. II, p. 234.

Battle of the Marne involved the sending of soldiers by Galieni from Paris in taxi-cabs. They arrived on the battlefield and some were killed and buried there. They were not first killed on the battlefield, resurrected, and then taken in taxi-cabs travelling all the way to Paris. The actual time-order is irreversible, as it is objective, and independent of the order of the perception of observers.

Alexander gives a sympathetic account of the Principle of Relativity and its Space-Time continuum, but he recognizes that it is a physical theory, while his own is metaphysical. He claims that there must be one Space-Time of which the space-times of particular observers are real (not illusory) perspectives. He is fully aware that physical doctrines and formulae, in so far as they concern themselves with Time, are limited to an interest in its measurement, leaving its *nature* a problem for the metaphysician to discuss. While the Newtonian concept of Absolute Time is modified by a doctrine of relativity of measurement, Alexander considers that Space and Time, or rather Space-Time, retains an absolute dignity and meaning of its own which is independent of all measurement. It is relative motion of observers which necessitates the individual space-times of observers. But, he writes, "whatever modifications it (the Theory of Relativity) introduces into the Newtonian mechanics it leaves Time and Space and Motion in their ancient reality, or rather it leaves us still with Space-Time in itself as a total from which perspectives are selections, and therefore in that sense absolute and independent of the observers. And I do not feel sure", he adds, "that any relativist would object to this in a metaphysical sense. Time and Space in their ancient pure reality remain as the *framework* of history, and the new doctrine is *a new doctrine of their sensible measures*".¹

By an elaborate discussion of what he technically calls "sections" and "perspectives", Alexander leads us on to his own special doctrines of contemplation and enjoyment, and of compresence. Contemplation is our relation to an object, enjoyment is our awareness of our selves and our states. From this, our categories, our objects, our mind and sociality can

¹ Alexander, *Space, Time, and Deity*, Vol. I, Bk. I, Chap. II. On "Perspectives and Sections", p. 91. The italics of the last phrase, "*a new doctrine of their sensible measures*", are mine and serve to bring out Alexander's agreement with the contention at the end of the previous chapter.

be explained as well as cognition (which is not for him a special category, but merely an example of "compresence"), appearance, freedom, and deity (which is for him the supreme quality, not substance).

In Alexander's view Space-Time is "the stuff of things". The evolution of the Universe is due to the restlessness of Space-Time and, indeed, to its creativeness.¹ The Emergent Evolution which thus arises produces new and unforeseeable qualities and is thus creative. His view is almost Bergsonian, and he acknowledges a debt to the French philosopher. Time, as in Bergson, is almost used synonymously with *élan vital*. Time is, as it were, the creative *natura naturans* of the Spinozistic system. Time is real, it is not a merely negative aspect of the Universe. It is true that the past is gone, but it is nevertheless real and its reality is to have existed when it did.² For Alexander (as for Croce and Gentile) the universe is history through and through. Time cannot be explained away by referring the existence of the Universe to a mere dialectic of thought. As Reyburn has pointed out, Idealism cannot explain away Time,³ and Alexander has more sympathy with idealism than probably any other realist has shown.

While paying high tribute to Bergson for his insistence upon the ultimate reality of Time, Alexander regrets that he does not accord similar status to Space, and he refers, as we have already done, to Bergson's consequent limitation of his conception to mental time alone, on an erroneous view of objective Time and narrow geometrical view of Space. For Alexander Time is spatial because it cannot exist alone. What Bergson regards as a weakness and error in our representation of Time, Alexander regards as a vital and essential truth. He explains Bergson's position as we ourselves did above, as due to his belief that Space is merely the abstract Space of mathematics, and that all *objective* Time is merely abstract mathematical Time. He refers to Locke's difficulty of recognizing physical or objective Time as well as mental or subjective time, and

¹ Alexander, *Space, Time, and Deity*, Vol. I, p. 72.

² Reyburn, "Time, Idealism", and *Mind*. Oct. 1913, pp. 493-508.

³ Heidegger's conception of *Die Sorge* is akin to this restlessness. Cf. his "Sein und Zeit" (*Jahrbuch für Phil. und phän. Forschung*, Bd. VIII (1927), SS. 1-438), where it is laboriously discussed in relation to his special conceptions of *Dasein*, *Zeitlichkeit* and *Wirklichkeit der Welt*.

avoids Bergson's subjective view entirely. For Alexander, as is natural from his realist views, physical and mental time are both truly Time. Events are happenings which may be either physical or mental, hence there is one Time-continuum of events, and physical and mental time are by equal right portions of one Time. In summing up the conclusions of Book I of *Space, Time, and Deity*, he says: "Whether in physics, in psychology, or in mathematics, we are dealing in different degrees of directness with one and the same Space and Time. . . . What is contemplated as physical Space-Time is enjoyed as mental Space-Time."

The Theory of Absolute Space, Time and Motion (Newton) is opposed by the Theory of Relativity (Minkowski and Einstein) and by the Relational Theory (Leibnitz), but these two theories are not the same. We have seen how sympathetic Alexander is to Minkowski's ideas and the Theory of Relativity. We may here note his attitude to the Relational Theory. Space and Time cannot be at once entities in their own right and at the same time merely relations between entities. In Alexander's view Space and Time are themselves entities, or rather there is one entity Space-Time and there are spatio-temporal relations within it.¹ In the Relational Theory, Space and Time are nothing but systems of relations between entities which are not themselves intrinsically spatio-temporal. Alexander admits, however, that while for him Space and Time are "stuffs" yet, within these, there are relations of the parts of space and of time. Both Space as extension, and Time as duration, are orders, one of co-existence, the other of succession, and order implies relation, but the relations are always relations within the respective entities Space and Time, or as Alexander prefers to put it, given empirical Space-Time, order of the parts of Space-Time is a relation. His view, however, is opposed to the Relational Theory, for Alexander considers that we have more than mere relations. The relations we call temporal are relations *in Time*, and Time is not merely the relations.

Time is not conceived by Alexander as a form of Mind, but rather Mind as a form of Time which is, for him as for Bergson, essentially creative. It is the abiding eternal principle of impermanence. It is the stuff that dreams and everything else

¹ Alexander, *Space, Time, and Deity*, Vol. I, pp. 168-9.

are made of, although it could not do its work without Space. Both Alexander and Bergson seem to personalize Time as the *élan vital* of the universe. If Time does nothing, it is nothing, they argue. But surely we may accept Time as, in Alexander's words, the principle of motion and change, without making it responsible for either. It is rather the function of motion and change than the creator of these.¹

The most besetting difficulties in Alexander's brilliant system arise from such problems as (1) the nature of Space-Time; (2) the relation of Space and Time to each other and to Space-Time; (3) the relation of Space-Time to the material world, to mind, to the categories and to Deity.

Alexander's list of categories is as follows:—

Identity, Diversity, and Existence.
 Universal, Particular, and Individual.
 Relation.
 Order.
 Substance, Causality, Reciprocity.
 Quantity and Intensity
 Whole and Parts, Number.
 Motion.

These, we are told, "are, as it were, begotten by Time on Space".²

Space-Time itself is not a category or a universal, it is the "stuff" from which and by which universals and categories are made. Within the one reality of Space-Time it is Time that is really the restless element driving Space to generate new things of all kinds on a rising hierarchy, life, mind, and Deity, a quality, a straining for perfection, not a *being*. "Existents are in the end and in their simplest terms, differentiations of Space-Time, the complexes of events generated within that matrix."

Extensive quantity is the occupation of any space by its time or the occupation of any time by its space. Space as so occupied is an extension. Time as so occupied is a duration. Quantity is thus equivalent to the bare fact that Space is swept out in Time or that Time is occupation of Space. On the other hand, intensity or intensive quality is the occurrence

¹ Alexander, *Space, Time, and Deity*, Vol. II, Chap. II, pp. 38-44.

² *Ibid.*, Vol. I, p. 189.

of various spaces in the same time or the occupation of the same space by different times. The simplest case of this Alexander cites as the velocity of a simple motion. Intensive quantity is the fact that Time may be filled by Space and Space by Time unequally.¹

Time, he claims, disintegrates Space directly by distinguishing it into successive spaces, while Space disintegrates Time indirectly by making it a whole of "times", without which whole there would be no separate "times". There would not be, according to Alexander's theory, aggregate wholes composed of individuals were it not for the connecting Space-Time.²

It has been argued by one critic that Alexander's Space-Time is really motion.³ This is, however, rather too cavalier a treatment of the difficulty. Certainly motion is spatio-temporal, but it can hardly be the same as Alexander's Space-Time, for it must be remembered that motion is one of his categories, while Space-Time itself is not a category. He asserts that "the category of motion is but another expression of the fact that every existent is a piece of Space-Time".⁴ We further learn that motion is "the totality" of what can be affirmed by every Space-Time. The attempt to equate motion with Space-Time naturally raises the question: What kind of motion could be even proposed as the equivalent of Space-Time? To this there can be suggested only one answer, conceptual rather than perceptual motion. When, therefore, Alexander places motion

¹ Alexander, *Space, Time, and Deity*, Vol. I, p. 306.

² *Ibid.*, Vol. I, pp. 312-13.

³ J. A. Smith, *On Alexander's Notion of "Space-Time"*, Proc. of Aristotelian Society, December 1924. Professor Smith says (p. 58): "I would ask him (Alexander) above all in the interests of his own doctrine to adhere to the word 'Motion' (with or without 'Pure') and to abandon the alternative 'Space-Time'. For it almost inevitably misleads the reader (as it misled me) into thinking that to arrive at what is so named it is possible to proceed by starting with Space and Time separately (assuming them to be already present or given to us) and then blending them in some way which is symbolized by a typographical hyphenation. That can only fail, for what is meant is not a blend of two separately apprehensible elements. . . . They are not by themselves what they are together, and (if apprehended separately) 'not all the king's horses and all the king's men can put Humpty Dumpty together again.'" But we must point out that Professor Smith is wrong if he thinks that he has discovered Humpty Dumpty's name to be "motion", for it actually, in Alexander's scheme, is the name of one of Humpty Dumpty's children, but not his own name.

⁴ Alexander, *Space, Time, and Deity*, Vol. I, p. 320.

in his list of categories has this an empirical reference or is it purely conceptual? He answers this query himself by stating that "motion is the border line between the categorical and the empirical region".¹ Exactly the same position arises over the status of point-instants. These, we are told, because they are the elements of Space-Time, itself the source of all categories, illustrate the intimate connection of the non-empirical and the empirical. They cannot be treated as finites, regarded as having a separate existence like ordinary finites. "Point-instants", he says, "are real, but their separation is conceptual."² "Real, they are, but if the apparent contradiction may be pardoned, they are ideal realities".³ Alexander frankly does not attempt to minimize the difficulties of this statement, which is just as well, for if the above remarks be taken as they stand, then the elements of Space-Time are ideal and it is difficult to see how Space-Time can be a matrix, a generator of all that is. Must it not be an ideal structure, a formal view, something akin to the organization of an army with its hierarchy of ranks. All soldiers, all battalions have their place in that hierarchy, but the "organization" itself does not by its restlessness create wars or achieve victories. As the concrete triumphs of battle cannot be explained as arising out of the mere organization of the army, so the concrete world of qualities can as little be got from the formal Space-Time.

Change is empirical, it is not categorical.⁴ Although motion is a category, change is not. Although all motion is change, all change is not motion. This Alexander recognizes and admits by saying that change is change of quality and all quality is empirical. Because of the quality element change cannot be a category, for quality is not a category in his system. It is questionable how far this line between motion as categorical and change as empirical can be rigidly maintained. Alexander cannot rigidly maintain it, for he states that "all existences, no matter what qualities they possess, are in the end complexes of motion".⁵ Change is, for him, grounded in motion and is the replacement of one set of motions by another.

Space-Time itself is not an existent, for existence we are

¹ Alexander, *Space, Time, and Deity*, Vol. I, p. 322.

² *Ibid.*, Vol. I, p. 323.

⁴ *Ibid.*, Vol. I, p. 329.

³ *Ibid.*, Vol. I, p. 325.

⁵ *Ibid.*, Vol. I, p. 328.

told "belongs to that which occupies a Space-Time". Further, it appears that the relation of Space-Time to the existents which occupy it is by no means easy to grasp. In a sense Space-Time is the totality of all existents, but the existences are not themselves parts of Space-Time. Alexander states quite definitely that "Space-Time is not a whole of parts". Yet it would appear that spaces are parts of Space and times are parts of Time. If, however, Space-Time is not a whole of parts, then Space-Time must be more than and different from the mere sum of all spaces and all times. Alexander puts this point by saying that "Space-Time breaks up into parts and wholes of them as it lives and moves".

If Space-Time were such whole it would, he affirms, be given all at once. But being Time (or, indeed, Space for that matter) it is not given all at once. This way of putting the matter curiously recalls Palágyi's conception of "fleeting space", but it is difficult to see why all Space cannot be given together. Of course, Time, being in essence succession within duration, cannot be so given. "To suppose so", as Alexander rightly affirms, "is to ignore the reality of Time, to fail to take Time seriously".¹

Space-Time is more than Space *plus* Time, for it possesses a mystic generative quality which Space and Time as such cannot possess. In this case the formal name Space-Time is perhaps unfortunate, for the restlessness of Space-Time surely implies that the additional mystical element in the conception which is more than Space *plus* Time is something akin to the creative force which lies included in Bergson's Time, which as universalized *durée* in *Creative Evolution* is practically synonymous with the *élan vital*. It would be better for Alexander to admit this rather than adhere to the formal name Space-Time, which is a quite inadequate description of it judged by what it does, by its achievements and responsibilities, in his striking system, where it operates as "the one and only matrix of generation".

He rather inexcusably denies it to be a unity, for fear we take it to be a unit or an individual substance. It is impossible to deny its unity if it be veritably the one and only matrix of all that is.

As Space-Time we think of it as the universal framework of

¹ Alexander, *Space, Time, and Deity*, Vol. I, p. 339.

all events, of all that is, but as matrix it is obviously creative, and this feature is so much more important, so much more vital than formal, that it might well be described as "The Matrix" rather than as Space-Time. How mighty Space-Time is in this way is seen in the assertion that it *includes* mind. "Time as a whole and in its parts bears to Space as a whole and its corresponding parts a relation analogous to the relation of mind to its equivalent bodily or nervous basis, or, to put the matter shortly, Time is the mind of Space and Space the body of Time."¹ "Bare Time is the soul of its Space and performs towards it the office of soul to its equivalent body or brain."² Rather than hold that Time is a form of mind, we must say (Alexander claims) that mind is a form of Time.

Any two finites connected in Space-Time are in "com-presence". Mind and its object is a relation of compresence, but this relation is not confined to mind and object. Mind as conscious of its object contemplates, as conscious of itself it enjoys. It can never "contemplate" itself.

Space-Time is living, it is "animated" and includes much more than mind.³ It also includes deity, which for Alexander is not a Person but a quality begotten by Time on Space-Time. Deity is subordinate to Time, and it is not mind, which is the last complexity of Time in finite existence. Deity is the quality which emerges at a later and newer level of evolution. For Alexander, deity is "the next higher empirical quality to mind. That the universe is pregnant with such a quality we are speculatively assured. What that quality is we cannot know: for we can neither enjoy nor still less contemplate it. Our human altars still are raised to the unknown God."⁴ "We cannot tell", he continues, "what is the nature of deity, of our deity, but we can be certain that it is not mind . . . or any quality of the order of mind; deity is not spirit, but something different from it in kind. God as the being which possesses deity must be *also* spirit, for . . . deity presupposes spirit."⁵ This God who has deity as an attribute resembles Spinoza's *Deus*: he is the All, the Universe. Deity as Alexander conceives it is the type of quality that Renan had in mind

¹ Alexander, *Space, Time, and Deity*, Vol. II, p. 38.

² *Ibid.*, Vol. II, p. 346.

⁴ *Ibid.*, Vol. II, p. 367.

³ *Ibid.*, Vol. II, p. 69.

⁵ *Ibid.*, Vol. II, p. 349.

when he spoke of God as Ideal and as coming to himself in the evolution of the Universe.¹ Bergson too remarked, "Dieu se fait dans l'évolution." Alexander's "Deity is a *nisus* and not an accomplishment". Such deity is the kind of quality for which we hunger with a great hunger in our sublimest moments, and for the sake of which we may sometimes be impelled like the man in Bojer's novel, who standing on the ruins of his life felt a vast responsibility to take heed that the divine does not die and that he must create it. He went out therefore and sowed corn in his enemy's field *that God might exist!*² But however fine this conception (like that in *The Undying Fire*³), may we not well ask, if Space-Time is all this, if it be a matrix which produces the quality of deity, is it not itself the framework and the matrix used by one who has that quality, a Deity who, so far from being begotten by Time or Space, has, himself, by his activity created things or events and thereby created Time?

The problem of Time is not made clearer by a welding together of Space and Time into a new hybrid conception for which no single word exists or has yet been invented and which is merely the hyphenated form Space-Time.⁴ To the *true* marriage of ideas we do not admit impediments, but although "*deity*" has been invoked to hallow this union we do not feel called upon to affirm that what Alexander has joined together no man shall put asunder. Time is not directly allied with Space but with events.⁵ Space is not dated but events are. If by Space-Time Alexander is approaching the notion of motion it must be remembered that Time cannot be given or presented as a whole in any perspective which merely includes motion. We have already noted the difficulty of equating Space-Time with motion. With regard to mental time, a difficulty arises which reminds us of our previous remark about Bergson's *durée*. I do enjoy myself, but I do not enjoy mental time; I contemplate it. Further, we must remember

¹ Renan, *L'Avenir de la Science*, p. 476 (English translation, p. 445).

² Johan Bojer, *The Great Hunger*, English translation, pp. 314-15.

³ H. G. Wells.

⁴ See our remarks at close of previous chapter.

⁵ Of course an *event* happens at some *place* as well as at some *time*, but the recognition of this point does not necessarily involve us in any particular theory of Space-Time. Cf. on this point Palágyi's discussion already noted.

Time does not depend on Space for its preservation or for its continuity. It is the continuity of events, not merely Space, which gives continuity to Time. It is by no means clear what is meant by the other relationship by which Time gives continuity to Space. All space is co-existent at an instant and does not need Time for its continuity. The continuity of Space lies in its co-existence and not at all in any succession. This is a highly important point on which Alexander seems to have curious views, shown in his treatment of the relations of points and instants. The succession-element in Space appears erroneous.¹ It is introducing a temporal element into the non-temporal. Succession is no feature of Space, but it is an essential of Time. For Alexander there is succession in Space itself, so that unexplored space is supposed to resemble the unexplored future, but there is nothing in Space like the future in Time. All Space co-exists, future or no future, because its co-existence does not depend at all on Time, as Alexander claims. Recognition of this point seriously impairs the validity of his doctrine of the interrelation of Space and Time. Present-Time becomes past. Space-Time can only be regarded as a continuum if it be taken as motion of things. In that case it is really Space *plus* Time, and this is not what Alexander means. Here again there is a difficulty, for it is hard to see how the *a priori* character of Space-Time can be maintained when its unity is said to depend on quite empirical data. The so-called perspectives of Space-Time help little to its elucidation, and in some respects they are superfluous. We do not enjoy mind as Space-Time. Further, Space-Time cannot give us the creative forces from which all qualities emerge, or help us to erect the hierarchy of beings the world contains. Space-Time relations are not necessary for postulating enjoyment and contemplation, for that enjoyment and contemplation involves selective work by mind. With Alexander, we can never be sure what mind is. It appears to cover in an unintelligible way Time and a multitude of other things such as Quality, Energy, as well as human Mentality. Quality, as we have seen, is not, for Alexander, a category. He further blends together, not only Space and Time, but other unique processes, such as cognition, feeling, and will, also sense, ideation, and

¹ Cf. views of Palágyi on "fleeting space".

memory, what he calls perspectives and appearances, as well as enjoyment and contemplation. He even fails to distinguish correctly awareness, which cannot be identified with existence. There is a distinct tendency in Alexander's work to identify the existence of Time with its presentation to us, but present time and presented time are not the same thing, as we shall see in our later discussion of the precise character of the specious present. The present involves existence, but our present is a result of perception and is specious. Alexander also tends to equate Time and things in time as well as to identify our awareness of time with our awareness of things or events, but although it is by these that we know time, we nevertheless distinguish it from events and things although the three (events, things, and time) are really given together in our experience. He does not always speak of the past without ambiguity, and tends to use the term without distinction for past existence, *the* past and *our* past, in the sense of our memory of past events, which, of course, is a present mental state not past at all, although it may be an image of the past.

Similarly Time is not regarded as unique in his philosophy, it is too much bound up with Space and Things, and is not sufficiently displayed as essentially related to events. In so far as Alexander has been influenced in his blending of Space-Time by the Relativists, it must be noted that they deal with purely physical problems. While he is treating a metaphysical topic, Relativity deals with measurements of Space and Time. It expresses these mathematically, but it does not state anything about the quality of either. As we have said at the close of our previous chapter, the measurement of time leaves the problem of its nature practically untouched. Alexander's insistence on the unity of physical and mental Time is, however, very valuable.

A less daring or less speculative discussion of the nature of Time, which is also related to the Relativity doctrines, is that of Whitehead and of Broad. They at least realize that any treatment of Time must recognize that events, be they physical or mental, are fundamental to it.

While it is true that Alexander's view is related to the work of the physicists, this is more noticeable in the work of Whitehead, and particularly in his discussion of the "events" by which time is known to us. We must already know what an event is before we seek to measure events and their relations. The understanding of the use of the word "event" in Whitehead's philosophy demands a certain amount of careful unravelling of phrases in his monumental volumes, *An Enquiry Concerning the Principles of Natural Knowledge* (1919), *The Concept of Nature* (1920), and *The Principle of Relativity* (1922). All three volumes are much occupied with discussions of the nature of events, and in the second *Time* has a chapter to itself.¹

In an earlier work, his little *Introduction to Mathematics*, Whitehead touches briefly on the problem of Time and shows how an interest in Time, its measurement and its nature, has arisen. Early reckonings were concerned purely with the order of succession as given in experience; later the determination of durations was sought, and in this connection periodicity came to play a prominent part. Quantity or duration of time is reckoned by measurement of natural events (i.e. events external to the mind) in their recurrence. Astronomy provides these most nearly although not exactly. "If", Whitehead says, "such a superior consistency had been noted among the recurrences characteristic of the human body we should naturally have looked to the doctor of medicine for the regulation of our clocks." But this is not so, and we look to the astronomers. Yet they are not exact absolutely, for the uniform time on which so many calculations are based is itself dependent on observation of periodic events.²

It is, however, in the later volumes cited that his treatment of Time is given, and it may be noted that the successive volumes from 1919 to 1922 show an evolution in Whitehead's thought. Hence we are prompted to ask with

¹ For a very brief view of Whitehead's doctrines given by himself, consult the paper at the Aristotelian and Mind Symposium in July 1919, "Time, Space, and Material, are they, and if so in what sense, the Ultimate Data of Science?" Aristotelian Supplement, Vol. II, entitled *Problems of Science and Philosophy*. The latest statement of Whitehead's views is, however, his paper "Time", at the Sixth International Congress, Harvard, 1926. (See *Proceedings*.)

² Whitehead, *Introduction to Mathematics*, p. 168.

one of his critics, "What does Dr. Whitehead mean by an event?"¹

Just as we find Eddington in his *Space, Time, and Gravitation* employing the term "interval" to mean, not distance in space or distance in time, but space-time measurement, so in Whitehead we find "event" used in a like special sense to cover not only time, but also space, so that "event" implies or involves the position or situation of an object in space. The "stuff" or structure of the world lies in a continuum, but this continuum or ground of nature is, in Whitehead's view, a continuum of events, or, as Alexander has put it, the Universe is history through and through. This appears relatively simple, but Whitehead also asserts that the "ether" (usually associated with electro-magnetic phenomena as a necessary medium for those happenings, otherwise difficult to explain) is actually an ether of events.

If, however, the use of the term "event" be extended to cover the position of an object in space as well as in time, one begins to question the relationship in this system of the "event" and the "object" or, in ordinary language, the "thing". What precisely is the distinction between "event" and "thing"? Lecturing before the Aristotelian Society in 1916 on this subject,² Whitehead remarked that "in analysing our experience we distinguish events and we also distinguish things whose changing relations form the events. . . . Things have certain relations to each other which we consider as relations between the space extensions of the things; for example, one space can contain the other or exclude it, or overlap it. A point in space is nothing else than a set of relations between spatial extensions. Analogously, there are certain relations between events which we express by saying they are relations between the temporal durations of these events, that is, between the temporal extensions of the events. . . . The properties of the extension of an event in time are largely analogous to the extension of an object in space. Spatial extensions are expressed by relations between objects, temporal extensions by relations between

¹ An interesting paper bearing this title was given by Sir Leslie Mackenzie, following a discussion by Whitehead at the Aristotelian Society in 1923 (*Proceedings of the Society*).

² Whitehead, "Space, Time, and Relativity". *Proceedings of the Aristotelian Society*, 1916. Vol. XVI, p. 107.

events. The point in time is a set of relations between temporal extensions".

Although this issues in the conclusion that Space is a relation between objects, and Time a relation between events, yet in *An Enquiry into the Principles of Natural Knowledge* three years later, Whitehead emphatically tells us that we must not conceive of events as in a given Time and a given Space and as consisting of changes in given, persistent material. "Time, Space, and Material are adjuncts of events. On the old theory of relativity Time and Space are relations between materials; on our theory they are relations between events".¹

His *Enquiry into the Principles of Natural Knowledge* is largely devoted to a discussion of the "Event", and he enlarges his exposition to introduce us to what he styles "percipient event" and the "complete event". Our perception of nature "involves a percipient object, a percipient event, the complete event, which is all nature simultaneous with the percipient event, and the particular events which are perceived as parts of the complete event". This involves a change in the attitude to objects as previously given. No longer can we say (at least no longer does he, Whitehead, say) that Space is a relation between objects, and Time a relation between events. The event has now completely absorbed the object. Whitehead admits this spiritual pilgrimage, this evolution in his own views, for he says "objects can be looked on as qualities of events, and *events as relations between objects*".² The term event has now become the basic and comprehensive term in this philosophy of nature. "Events are the relata of the fundamental homogeneous relation of 'extension'. Every event extends over other events which are parts of itself, and every event is extended over by other events of which it is a part. The externality of nature is the outcome of this relation of extension. Two events are mutually external, or are 'separate' if there is no event which forms part of both. Time and Space both spring from the relation of extension".

It is obvious that here we have a highly specialized use of "extension". It is unfortunate that in the matter of vocabulary Whitehead should add to the difficulties of his readers. The main trouble arises because he has not made new words, but

¹ Whitehead, *An Enquiry into the Principles of Natural Knowledge*, p. 26.

² *Ibid.*, p. 60 (*italics mine*).

retained the old ones with new meanings, in part at least the direct opposite of their ordinary meaning. Extension is usually employed precisely to mean spatiality, yet he uses it to include temporality without quite clearly saying so. Similarly it is unfortunate to apply the word "event" equally to space and time, because the time connotation of the word will keep breaking in and predominating. It is all the more unfortunate, in view of Whitehead's clear statement about events being essentially and solely temporal, that in his later development he did not invent some new term or use a compound like "event-thing" or "tempo-factum" to indicate his meaning, which really is simply that every happening occurs *somewhere* at *sometime*.

The terminology of Whitehead is thus by no means clear, and his own change of terms between 1916 and 1919 adds to the confusion. On the one hand we find him asserting that "Time is a relation between events", that "things form events by their changing relations", and that "an event is a situation of an object". Here the stress is given to objects to which events are subordinate. On the other hand, he claims that an object is to be regarded as relatively permanent in the flux of events and that "an object is the quality of an event". Now it seems that the object is subordinate to the event. There is either inconsistency here, or, more likely, a change of view. Miss May Sinclair's remark appears to sum up the situation. "To be sure, what you lose on the objects you gain on the events". The new "event" has absorbed the old object.¹

Space and Time in Whitehead's philosophy are each partial expressions of "one fundamental relation between events which is neither spatial nor temporal". This relation he calls in his own vocabulary "extension". The relation of "extending over" is the relation of "including" either in a spatial or a temporal sense or in both.² We have already noted his special use of the term "extension". Similarly this special usage is seen in the use of "duration" which Whitehead employs, not as a stretch of time in the general psychological sense, or in the special

¹ May Sinclair, *The New Idealism*. This volume contains some shrewd although rather colloquial discussions of Whitehead, Alexander, Russell, and other contemporaries.

² Whitehead, *The Concept of Nature*, p. 186.

Bergsonian sense of *la durée*, but as a "slab of nature". He himself even admits that the term is misleading, but he nevertheless uses it. This duration, bounded by temporal extension, but including all space, is really the One Big Event. But the event here-present known by mind in the percipient event is related to the complete event or momentary Totality of Nature by Co-gredience, and the Constants of Externality. A duration may contain many co-gredient events. Co-gredience is a condition for a percipient event, yielding unequivocal meanings to "here" and "now"; it is the relation of absolute position within a duration. The Constants of Externality are the characteristics of a perceptual experience by which we assign to it the property of being an observation of the transition or passage of external nature. An event for Whitehead is a fact which has such characteristics. We must add, however, that events are not confined to external nature, that occurrences within the mind (including those other than percipient events) are equally events. Whitehead is not very definite about this.

The demarcation of events is difficult, for in perception no event has well-defined limits either in space or in time. As Whitehead puts it, "The definition of an event by assignment of demarcations is an arbitrary act of thought corresponding to no perceptual experience". He does not assert that events are entirely atomic in structure or that they do not overlap. They do overlap, and it is this feature which renders the making definite of any event so difficult. All events are parts of others. The event of the driving of a motor-car along a street is but part of the life-history of that street. The turn of the wheel is but a part of the journey of the car. The boy's winning the athletic prize is an event which includes his supreme final spurt, and on the other hand, this spurt and the whole race is but an event in one term of his school-days, a small portion of his time at school, itself but an event in his whole education, all of which itself is only an event in his life-history.

Whitehead makes much of the method of Extensive Abstraction. This method is a determinate logical procedure which "in its sphere achieves the same object as does the differential calculus in the region of numerical calculation". Its aim is to simplify events, but to do so more exactly than by the instinctive procedure of habitual experience which is only approximate.

The purpose of the Method of Extensive Abstraction is to formulate the law by which such approximation can be achieved and continued. The complete series gives what is styled "a route of approximation". The elements involved in this method are Event-particles (the points of instantaneous space), Routes (linear segments between event particles), Moments of Time (i.e. the content of all instantaneous nature), and the Volumes incidental to these moments. This use of "moment" is, like that of "duration", a special use quite unlike the ordinary moment of time which is a purely temporal unit. It is but a further instance of Whitehead's use of a highly specialized vocabulary.

An event as apprehended is related to a complex whole of nature which extends over it and is the duration associated with the percipient event of that perception. All events are associated with a general "community of nature" which is deemed common to each individual, as his one enduring world in spite of the breaks in his perception, as, e.g. through sleep. We may, in order to examine events, select some durations, i.e. some point in space, and note the happenings, or we may follow the life history of objects, which is usually simpler. One immediate event and immediate object will be the body which links the awareness of the percipient to the external world.

The structure of events provides the framework of the externality of nature within which objects are located. Objects do not cause events, they qualify them, for objects are entities recognized as pertaining to the events, as the "recognita" amid the complex flux of events. This ether of happenings or structure of events is the warp and woof of the unfolding web of Time. It is Time that is the qualitative passage of Nature; it is allied to, although not to be identified, as Bergson has identified it, with the creative advance of Nature.

There can be no apprehension of external events apart from recognition of sense-objects, and there can be no recognition of sense-objects save as in relation to events. Perception involves a percipient event (the action of mind as awareness) and a duration within which that percipient event is placed and with which it is, to use Whitehead's term, "co-gredient". There are various sets of events not necessarily mutually exclusive. Percipient events are awarenesses of mind. There are events

which are situations of the sense-object and also conditioning events. The latter can be subdivided into active and passive events or conditions. The active class can be further divided into transmitting events and generative events.

Objects, Whitehead claims, do not cause events. Causality is bound up with events and a cause is always an event, an active event. In perceiving "the everlasting hills", or an unchanging cliff, the recognition of the permanence involved—namely the object—overshadows other perceptions, the flux of events not being apprehended and becoming merely a vague background.

Time cannot be a relation between objects, but between events. This is recognized by Whitehead, who in his work on *The Principle of Relativity* points out that it would involve rejection of Einstein's view of heterogeneity in respect of Space-Time. If time be a relatedness of objects then the contingency of objects will be shared and heterogeneity will arise. If, however, it be a relatedness between events, then there follows an independence of the contingency of the adjectives; it is uniform or homogeneous. Whitehead does not pursue this argument as far as Alexander did in favour of a single One Time system, indeed he upholds plural time-systems most emphatically, but he admits that the difference here involved is "really of the utmost importance in the stage of physical science."

He does, however, reject the distinction between personal time and the impersonal Time of nature, such as is involved in Bergson's treatment of time as real, as *la durée*, but false when spatialized, and expressed quantitatively. Bergson's "duration" has nothing in common with that of Whitehead. While Whitehead builds on his Method of Extensive Abstraction, the French philosopher's *durée* is built on a method of *intensive abstraction* which, so far from being real Time, is not Time at all.

An event with all its dimensions ideally restricted (by Extensive Abstraction) is by Whitehead named an *event-particle*. An event with only one dimension of finite extension he calls a "route". A route which lies entirely in one moment (as he uses moment) is a spatial route, but one which lies entirely in the past and future of each one of its event-particles he,

following Broad, calls an historical route. It must, however, be borne in mind that routes are not really and truly events, but ideal limits or abstractions into one dimensional extension. Historical routes are connected with or "pervaded by" an adjectival particle or object.

Whitehead distinguishes simultaneity from instantaneousness. Simultaneity is an ultimate factor in nature, immediate for sense-awareness, and is bound up with the components of a single duration. Instantaneousness is an abstraction and an instant is devoid of any temporal extension. A moment is all nature at an instant. A moment has no temporal extension and is quite different from a duration. Moments are abstractions of minimum extension formed artificially from our sense-awareness of durations. We can make an abstractive set of durations. Moments in a series each exhibit an instantaneous state of nature. This series is, however, an abstraction arrived at by the method of Extensive Abstraction, and devoid of the real time-flow or actual quality of passage. This serial time is not the ultimate passage of nature itself. But "any theory of time which fails to provide such a measurable series stands self-condemned as unable to account for the most salient fact in experience".¹ The instantaneous moment is merely an ideal limit of perception. Have you ever endeavoured to capture the instantaneous present? It eludes you because in truth there is no such entity among the crude facts of our experience. Our present experience is an enduring fact within which we discriminate a passage of nature. Now within this enduring fact we observe rest and motion. A body at rest in the space of our observation is tracing out a certain historical route intersecting the moments of our time-system in a sequence of instantaneous points. This route is what we mean by a point of the permanent space of our time-system.

Thus nature appears to us as the continuous passage of instantaneous three-dimensional spatial "spreads", the temporal passage adding a fourth dimension. Passage in time is of the essence of nature. A body or object is merely the coherence of adjectives qualifying the same route through the four-dimensional space-time of events. "Nature is a becomingness of events which are mutually significant, so as to form a systematic

¹ Whitehead, *The Concept of Nature*, p. 65.

structure".¹ Nature is an abstraction from something more concrete than itself which must also include imagination, thought, and emotion.² It is characterized by systematic coherency of its interconnections disclosed in cognizance by relatedness. Nature is the system of related things and the ultimate facts of nature are events. We cannot claim that nature is in Time, we must hold that Time is in nature. There is Time because there are happenings, and apart from happenings there is no Time. Time, it is true, extends beyond nature (nature being closed to mind), but we must note that Time, in the sense of a strictly *measurable* series, is a character of nature only and does not extend to the processes of thought and of sense-awareness, except by a correlation of these processes with the temporal series implicated in their procedures.

This line of thought, supplanting stuff by events and conceiving events as involving process, extension, contingent qualities and primary relata in the relationship of ingression, is a recurrence to Descartes' views, with a difference. Descartes, like Spinoza and the rest of the world at that time, completely dissociated Space and Time.³ He assigned extension to Space and process to Time. It is true that Time involves extension of some sort, but that does not seem to have coloured his philosophy. Now, according to Descartes, extension is an abstract from the more concrete concept of stuff. He considered stuff as being separable from the concept of process so that "stuff" or matter fully realizes itself at an instant without duration. Space is thus a property of matter, and accordingly resembles stuff in being essentially dissociated from Time. He therefore deduces that Space is an essential timeless plenum. It is merely an abstraction from the concrete world of appearance at an instant. If there be no stuff to appear there can be no Space.

If, as Whitehead suggests, we re-write this Cartesian account of Space, substituting events (which retain process) for stuff

¹ Whitehead, *Principle of Relativity*, p. 21.

² Are Dreams ruled out? If so, why? A dream is an *event* in my life history, although the events of the dream be not in my usual time-series. Compare on Time and Dreams the book by Dunne, *An Experiment with Time* (1927).

³ See the discussion in Alexander's *Spinoza and Time and Space, Time, and Deity*, Vol. I, p. 44; Vol. II, p. 401; also the conclusion of my little volume, *Benedict Spinoza*.

(which has lost process), "you then return to my account of space-time, as an abstract from events which are the ultimate repositories of the varied individualities in nature." Space and Time are the exhibition of relations between events. Time involves the passage of events or the passage of events involves Time, is Time. The relation of the object to the event is that of ingression. Whitehead regards events as concrete elements, objects as abstractions. The events are "the ether". There is no ether of a material kind, only an "ether of events". The old conception of the ether Whitehead regards as quite futile and fruitless, and he (citing Bacon's phrase) likens it to 'a barren virgin.'

There is no such thing as a bare event. The passage of an event involves objects which do not pass (they may, of course, and do, change). Events cannot be recognized; they pass and are each unique. A character of an event can be recognized, for it is an object. An object is an entity of different type from an event, e.g. the event which is the life of nature within the Great Pyramid yesterday and to-day is divisible into two parts, namely the Great Pyramid yesterday and the Great Pyramid to-day. But the recognizable object which is also called the Great Pyramid is the same object to-day as it was yesterday. Unfortunately, when the event is the situation of any well-marked object we have no language to distinguish the event from the object. Our consciousness discloses to us this structure of events "as uniformly stratified into durations which are complete nature during our specious presents", according to Whitehead.¹ This is true, but why say "uniformly"? Our specious present is not a constant, and is not uniform. On the old theory of relativity, Time and Space are relations between materials, but really they are relations between events. The ideally simple event is one indefinitely restricted, both in spatial and in temporal extension, namely, the instantaneous point. Whitehead uses the term *event-particle* for instantaneous point-event. Objects can be looked on as qualities of events and events as relations between objects. Relations and relata imply each other. What we discern is the specific character of a place through a period of time. "This", he says, "is what I mean by an event". He defines a place by saying that it can only be

¹ Whitehead, *Principle of Relativity*, p. 25.

marked by phenomena capable of recognition, e.g. by the continued appearance of a material body. Nature is processional, it is a passage. Bergson uses passage of time for passage of nature, but this is not correct; transition in space is a form of passage of nature, not of time. The passage is not measurable in so far as it is qualitative in nature or in mind. Passage or transience is a quality of both nature and of sense-awareness. We should say mind rather than sense-awareness, for thoughts have passage, and their transience as well as sense-data give us mental time.

Mind, Whitehead says, is not in time in the sense in which events of nature are in time. This tends to do away with his earlier refusal to admit any distinction between physical and mental time. He points out in an almost Bergsonian tone that the passage of nature is the creative force of existence. We confuse this creative advance, which we experience as change and know as the perpetual transition of nature into novelty, with quite another thing, the time-series we employ for measurement. Measurement presupposes matching, so it is of no use to hope to explain matching by measurement.

Events are the relata of the fundamental homogeneous relation known as extension. Every event extends over other events which are parts of itself, and in addition every event is extended over by other events of which it is a part. Separate, distinct events are those which have no part in common. Events are the elements of actuality, and are the elements of change or of becomingness. Each event is a unique happening. It never can happen again. History does not really repeat itself. Events are particulars, objects are universals, or we may say, quasi-universals.¹ Time (and Space) express relations between events. Event-particles are related by an "impetus", says Whitehead in a manner that recalls the Bergsonian *élan vital*, and, we might add, the Spinozistic *natura naturans*.² The *élan*, the advance, development of nature, its continual becoming, brings new events into existence. Hence the relations between events change in the sense that an event *e*, present, becomes past, for the simple reason that nature produces *f*

¹ If "universals" be employed for particular objects we would have to invent a word for "universals", e.g. ultra-universals.

² See Gunn, *Benedict Spinoza*, Chap. III.

in its creative advance and fruitfulness of happenings. Events do not change; they become, they happen. By insisting on this fundamental becoming of new events, Whitehead has acted rightly, and the importance of this point is to be noted in the use which we shall later make of it against one of McTaggart's arguments about the unreality of Time.

Considerable ambiguity has attached to the use of the word change, a point on which, as we shall see, Broad lays considerable stress. To apply the term "change" to events is confusing and likely to be productive of error. We prefer to use another word, "transition" or "transience". Whitehead, it may be noted, uses the word "passage". It is immaterial which term is employed provided we do *not* employ change in this connection. It must be reserved for objects. Events never change, there is transition of events or passage from present to past. Future events are not strictly events: they are imaginations about events, they are hypothetical, not actual.¹

An event is an actual happening, and it is what it is when it is and where it is. There is nothing arguable, discussable, hypothetical about it; it is quite literally, as nothing else is, *a matter of fact*. An event is there and not here, or else here and not there; it is then and not now, or else now and not then. In its transition an event passes into some event other than itself, but in transition becomes part of larger events.

Since events do not change, nor are permanent (for they pass), they are thus distinct from objects. Events are lived through, for they are the *media* within which our entire experience develops. They are, in fact, as Whitehead put it, "the development of that experience. The facts of life are the events of life".² Objects are distinct from events, although popularly they are only vaguely discriminated. Objects recur in a way that events do not, and they have a certain permanence, while at the same time undergoing change. Whitehead seems to limit unwarrantably this change of objects to those types of change which are due to relations altering because of new events and changing relations to other objects. He does not

¹ On the status of the Future, cf. Dunne, *An Experiment with Time*. A more serious contribution on this subject is the book by Osty, *Supernormal Faculties in Man*. Cf. also our remarks *re* Lotze, p. 145, and our discussion in Chap. VII.

² Whitehead, *Principles of Natural Knowledge*.

appear to account sufficiently for the immanent changes of objects, as distinct from transgredient changes, to employ a distinction maintained by Windelband.¹ Objects have not the definiteness of relations which events possess. We tend to fluctuate between sense-objects and the scientific objects. The objects must, however, in any view be distinguished from events. The object is a unity, events have parts. Whitehead denies that objects have parts. "The continuity of nature", he claims, "is found in events, while the atomic properties of nature reside in objects." While we can see his point in this assertion it seems to neglect the continuity due to the (relative) permanence of objects. So keen, however, is he upon this vital distinction of objects from events, that he desires a separate term to be used in our perception of each. We "apprehend" an event, we "recognize" an object. Hence we apprehend nature as continuous and we recognize it as atomic. To apprehend an event is to be aware of its passage as happening. To recognize an object is to be aware of it in its specific relations to definite events in nature. The continuous ether, says Whitehead, is the whole complex of events; and the atoms and molecules are scientific objects which are entities of essentially different type from the events forming the ether. Objects, he suggests, are only in space and time indirectly, or derivatively, through their relatedness to events. The ultimate facts are the events of life, and they arise from the inherent and fundamental change, becoming, or creativeness of Life, Nature, the Universe or the Deity.

Our Universe has a certain dual character which is paradoxical. There is the constant change or becoming in nature, a feature which has been stressed almost to the entire exclusion of other features by Heraclitus and his modern counterpart, Bergson. But in some measure antagonistic to this, we have the abiding qualities of permanence in nature which enable us to know it, and to an extent to trust it, as having a certain similarity, endurance and uniformity within limits. Our perception of the Universe is only possible through a constant recognition of (relatively) permanent objects amid the flux of events, together with a grasp, an apprehension of the everlasting change or becoming of the Universe through events

¹ Windelband, *Introduction to Philosophy*, p. 124.

and therefore through time, which is but the continuity or structure of events. Apart from events we could have no perception of time at all.

Whitehead's latest pronouncements on Time were given at Harvard in 1926 to the Sixth International Congress of Philosophy. In addition to extending his vocabulary, by the introduction of some new phrases, he there argued that the concept of Time is complex and arises from the interplay of three fundamental categories, Supersession, Prehension, and Incompleteness. Time requires incompleteness. A mere system of mutually prehensive occasions is compatible with the concept of a static timeless world. Each occasion is temporal because it is incomplete, there is no one well-defined entity which is the actual world. This phrase, "the actual world", means the past, present, and future occasions as defined from the standpoint of some present occasion. It is a demonstrative pronoun, analogous to "he", "she", "it", to-morrow and yesterday! Its meaning is defined by its context.¹

The Prehension, as Mead argued, is really in the specious present. The binding is psychological, but this process itself is an instance of the creative advance of nature.

With regard to simultaneity Whitehead says in this, his latest pronouncement, that the term is ambiguous. "It may mean those occasions which are not causally related to occasion A, either as causing or caused. But it may mean those occasions which are prehended in A with presentational immediacy. If we identify these two meanings we are reduced to the classical view of time as strictly serial. If we hold that the presentationally immediate occasions are only some among the occasions which are not causally related, we can include the modern relativity-theory in this doctrine of time".² But, apart from the paradox of non-seriality, his whole paper is directed to explain the relativistic conclusion that individual perceptivity is the ultimate physical fact.

He regards Time as "epochal", claiming that supersession is not a continuous process of becoming, and that if we try to combine the notions of supersession and continuity we become entangled in a vicious infinite regress. This view is, of course,

¹ Whitehead, "Time." *Proceedings of Sixth International Congress, Harvard* (1926), p. 61.

² *Ibid.*, p. 63.

connected with the quantum-theory of modern physics.¹ He cannot, however, deny continuity and contents himself by saying rather mystically: "There is no continuity of becoming, but there is a becoming of continuity."²

Mead, who followed Whitehead at this conference, stresses the conception of Nature as an organization of perspectives which are there in nature. He points out that Whitehead's principle of organization of perspectives is not the representation of an identical content, but the intersection by different systems of the same body of events. This involves "the abandonment of simple location as the principle of physical existence, i.e. that the existence of a physical object is found in its occupancy of a certain volume of absolute space in an instant of absolute time, and the taking of time seriously, i.e. the recognition that there are an indefinite number of possible simultaneities of any event with other events, and consequently an indefinite number of possible temporal orders of the same events, that make it possible to conceive of the same body of events as organized into an indefinite number of different perspectives".³ The conception of a body of events is the organization of different perspectives of those events.

This primary insistence upon events is the most valuable aspect of Whitehead's work in connection with the nature of Time. His philosophy is difficult and not a few of the difficulties are due, as we have remarked, to his peculiar vocabulary. With reference to Whitehead's introduction of levels, reets, and puncts, as well as other matter and difficult technical mathematics, one writer has remarked that while "Einstein chastized the physicists

¹ He can, however, offer no definite time-quantum as a unit. This involves points which bear on the controversy in physics with regard to *continuity* of energy between Schrödinger and Heisenberg, a point to which Russell refers in his *Outline of Philosophy*.

² Whitehead, "Time." *Proceedings of Sixth International Congress of Philosophy*, pp. 60, 63-4. In 1925 Whitehead delivered the Lowell Lectures which, with some additional essays, have been published as a very readable volume entitled *Science and the Modern World*. He there speaks of enduring objects as "patterns" of events. He warns us against regarding time as another form of extensiveness. "Time is sheer succession of epochal durations." "Temporalization is realization. Temporalization is not another continuous process. It is an atomic succession. Thus Time is atomic (i.e. epochal), though what is temporalized is divisible" (*Science and the Modern World*, Lect. VII, "Relativity", pp. 182-5.)

³ Mead, The Objective Organization of Perspectives. *Proceedings of Sixth International Congress, Harvard*, 1926, pp. 75-85.

with whips, Whitehead has chastized the mathematicians with scorpions".¹ Other difficulties arise from his ambiguity or change of view in his treatment of events and objects.² It is difficult to see what factors in nature are not events, yet Whitehead declares that there are such, presumably laws or truths. Further careful exposition from him might explain away these and similar difficulties in his treatment, but meanwhile much of it is inconsistent on rigorous examination. Natural philosophy (he remarks on one occasion) should never ask: "What is in the mind and what is in nature?" We leave to metaphysics the synthesis of the knower and the known. The philosophy of science is "the philosophy of the thing perceived", *qua* thing rather than *qua* perceived, and it should not be confused with the metaphysics of reality of which the scope embraces both perceiver and perceived.³ Yet, if the philosophy of science is the philosophy of the perceived, it is difficult to see how this can possibly be reconciled with his much debated ambiguous and rather dogmatic statement, "Nature is closed to mind". Particularly his use of the term "percipient event" seems inconsistent with the general position which he desires to adopt in regard to Nature.

Unfortunately the whole of Whitehead's philosophy suffers from too narrow a definition of "Nature". He excludes from it mind and also the temporal phases of existence. The statement "Nature is closed to mind" in any of its meanings seems to exclude altogether the content of our experience in sense-perception. But nevertheless, he manages to smuggle mind in by a back staircase under the cloak of a percipient event. His definition of Nature is, he confesses, "an abstraction from something more concrete than itself, which must include imagination

¹ Haldane, *The Reign of Relativity*, p. 74.

² The gravity of this point has been well raised by several critics. By Haldane in his volume, *The Reign of Relativity*, and by Miss Stebbing in an article in *Mind* (July 1924), entitled "Mind and Nature in Professor Whitehead's Philosophy". Reference is also made in Miss Stebbing's article to Cisar's articles on "Space and Time" in *Mind* for the same year, sponsored by Whitehead. Mr. Miller, in a paper on "The Emergence of Relativity in Whitehead's Philosophy", read at the Australasian Association for the Advancement of Science, 1923, and reprinted in the *Australasian Journal of Psychology and Philosophy*, 1923 (December), raises similar difficulties with regard to Whitehead's view of Nature and his view of *Naturphilosophie* (philosophy, for him as distinct from metaphysics).

³ Whitehead, *The Concept of Nature*, pp. 28-30.

and thought". On this point alone his definition of Nature is unsatisfactory and inconsistent, but the second exclusion, that of the temporal phases of existence, has even more bearing on our problem of Time. He denies that there can be nature at an instant. This exclusion amounts to a denial of objective change, a view which is contrary to all science and metaphysics, and is in itself inconsistent with other portions of his work.

His narrow and erroneous definition of Nature also obliges him to identify it with the specious present. He confesses that "Time is known as an abstraction from the passage of events", that is to say, the Time which is an ordered series of instantaneous states of nature cannot be, for him, the passage of nature itself. The fact of continuous change makes it impossible, however, to accept a view which states that reality or nature occupies a *specious* present. The specious present is a characteristic of our perception, not of the reality which is perceived. That reality is a world of events, an historical world, i.e. a world of happenings in procession and it is characterized by continuous, instantaneous change.

The nature of this continuous change in relation to Time has been raised and emphasized by Broad, who also has much of importance to say about the nature of events and the definition of past, present, and future, as characteristics of Time. Broad has devoted no small portion of his work to discussion of the problem of Time. He contributed an important article on *Time* to Dr. Hastings's *Encyclopaedia of Religion and Ethics*. In his book, *Perception, Physics, and Reality: an Enquiry into the Information that Physical Science can supply about the Real* (1914), he discusses critically some of the fundamental problems involved in the Michelson-Morley Experiment and the Theory of Relativity (as formed at that date). In his latest volume, *The Mind and its Place in Nature* (1925), he has something to say about Time and Space-Time, while his intermediate work, *Scientific Thought*, published in 1923, is extremely valuable in this respect. Two chapters, one in the first part on "The General Problem of Time and Change", another in the second part on the "Dates and Durations of Sensa and of Physical Objects and Events", are specially devoted to the

Time problem, while acute discussions of it are to be found throughout other chapters such as those devoted to Motion and Space-Time.

Broad is particularly clear in his treatment as a rule, courageously independent and patiently exact in his thought. His work aims at combining the main tenets of realism with Whitehead's distinction between sense-objects, perceptual objects, and scientific objects. He is at pains to point out with much detail and care the sensible and perceptible facts which underlie the highly abstract concepts of science, and the cruder but still highly sophisticated concepts of common sense. We are not directly concerned here with his important discussion of the ontological and epistemological status of *sensa*. His doctrines demand careful comparison and contrast with those of Alexander and Kemp Smith,¹ and he favours a generative rather than a selective theory like that of Alexander. We shall here merely note that he is of the opinion that *sensa* are not fictions, existing nowhere and nowhen, but are themselves a unique group of existents whose members bear to each other peculiar relations which exist only between *sensa*. In a statement in *Contemporary British Philosophy* he says that it seems clear that either (1) sensible determinates (such as some particular shade of red) do not inhere in regions of physical Space-Time, but in regions of some other Space, or (2) that if they do inhere in regions of physical Space-Time, they must inhere in the latter in some different way from that in which physical determinates (like physical motion) do so".² His philosophy in general is analytic and critical rather than synthetic and speculative, and thus stands in marked contrast to that of his predecessor, McTaggart, to whose doctrines on Time he is entirely opposed. *Scientific Thought* is no less important a contribution to philosophy than *Space, Time, and Deity*, and contains in some respects sounder views. It might be said that Broad stands nearer to Whitehead than to Alexander. He discusses many problems which are similar to those of Whitehead, but does so in his own independent and illuminating way, and his work is better ordered and set out than that of Whitehead.

¹ Kemp Smith, *Prolegomena to an Idealist Theory of Knowledge*.

² He suggests, however, that these alternatives are not absolutely exclusive.

Like Whitehead, Broad starts from events as the positive and fundamental starting-point in the discussion of Time. He realizes that it is important we should know what events and their relations are at the outset. We have noticed the importance of the "event" in relation to any discussion of Time. Generally we mean by it anything which *happens*, whether of a material or mental character. The appearance of a comet is an "event", the dropping of a picture from the wall, the stopping of my watch, or my recollection that I must post a letter; all these are events, and they are changes. Many of them are complex and resolvable into a little series of simple events. Where are we to stop and say *this is an event* pure and simple?

This is a problem of grave difficulty. Mr. W. E. Johnson has suggested a distinction between *occurrent* events (like a flash of lightning) and *continuant* events (the shining of the sun), but it is a suggestion which in itself is not of great value save as an attempt at description.¹ It would, on a rigorous application, lead on to an attempt to interpret continuant events in terms of occurrent or supposed momentary events after the manner of the method of Extensive Abstraction. Are we to get down to infinitesimals with Whitehead and talk of momentary events or *point events*, or to reject this and extend our term, as Whitehead also would do, to the endurance of a piece of marble or, as Broad suggests, to include the cliffs of Dover?²

Broad uses the word *event* for anything that endures at all, no matter how long it lasts or whether it be qualitatively alike or qualitatively different at adjacent stages of its history or its life. He admits that this is contrary to our popular and general use of the term, but considers it absurd to give the name to a flash of lightning or a motor accident and to deny it to the continued existence of the cliffs of Dover. The cliffs are events, longer in duration, it is true, than the flash or the smash. All are bits of history and therefore events. We would add that they are both *unified* bits of history, and Broad in his view of the legitimate use of "events" lays the most important stress on

¹ Johnson, *Logic*.

² Whitehead, in his *Principle of Relativity*, says: "An event does not in any way imply rapid change; the endurance of a block of marble is an event." Broad's discussion is in his *Scientific Thought*.

unity or continuity of history. He, so to speak, looks upon the bread on the table as a loaf, most emphatically, a whole loaf and nothing but that. Whitehead, however, in his method of Extensive Abstraction, while not denying that it is a loaf, is carefully analysing the crumbs to see if he can further divide them up into atoms or indeed mere points!

We must identify an object with its whole history, as Broad urges.¹ If we are unwilling to do this, then we must note the consequences. If we identify it with a momentary section of its history we leave out Time altogether, and then it is an object incapable of enduring or existing, it is merely a fragmentary and artificial abstraction. Again, if we restrict it to a *uniform* section then we simply select a portion devoid of any striking change, which is a quite arbitrary procedure. There is then no valid reason for denying the term event to the existence of the cliffs of Dover, or the life of Bismarck. For the historian Bismarck's life is an event, for the geologist the cliffs of Dover are events, and to the astronomer our planet is an event, so is our sun and our solar system.

Any happening is an event and, indeed, anything having a history must be regarded as an event, but it can be subdivided into smaller events. Any object which comes into being and endures is an event. Any object, however, which had not come into being, but always existed, would *not* be an event. The Deity would not be an event, even on this wide interpretation, for He would not have happened or occurred at all. He would have existed eternally and so would be outside the class of events and *ipso facto* outside of Time. The existence of humanity, the whole history of our universe, may be (to Him) an "event".

While we cannot, in theory, deny the term event to any strand of history, nevertheless in precise investigation the shorter we can make our events the simpler are the relations between them. It is this need for simplification which justifies the method of Extensive Abstraction used by Wiener and Whitehead. By this means we "analyse" our events into so-called "momentary" events. It must be carefully understood, however, what we are really doing. It is very definitely a method of *abstraction* and takes us away from the concrete, for we do not perceive "momentary" events. Further, such momentary events

¹ "On Sensible and Physical Motion", in *Scientific Thought*, p. 410.

cannot make up real events any more than we can make up Space (which is essentially extended) by collections of points which are without length or breadth or any volume whatever. "Momentary events", as Broad puts it, "are not really events any more than points are little volumes". Further, momentary events are not parts of a real event in the sense that a second is $1/60$ th part of a minute or a minute a $1/60$ th of an hour. Sixty seconds will always give us the definite finite duration of a minute, sixty minutes give us an hour, a considerable duration in time, but no sum of abstractions such as non-durational moments can give us any real duration of time.¹ "Just as we treat our geometry in terms of unextended points and their relations, so we treat our chronometry in terms of moments without duration and *their* relations. Duration in Time corresponds to extension in Space", but he admits on the previous page, that spatial analogies help us little in dealing with Time, "for just", he continues, "as we never perceive points or even unextended particles, so we are never aware of moments or of momentary events. What we are aware of are finite events of various durations. By an *event* I am going to mean anything that endures at all, no matter how long it lasts, or whether it be qualitatively alike or qualitatively different, at adjacent stages in its history."²

Broad shows that events may overlap and that the possible relations between two events are nine in number. Let A B equal a time line with an irreversible direction A B, and let L M and X Y be two events, of which X Y lasts for a longer duration of time; then nine relationships may be set out as mainly partial precedence and partial subsequence.

While the problems of Time at first sight appear similar to those of Space (except that the single dimension of Time as compared with three of Space seems to promise greater simplicity), the analogies are superficial and useless. To attempt, for instance, to understand the fundamental temporal relation of before-and-after by reference to a line is of little avail, and indeed a circular argument, for the line only gets its *sense* through a tacit reference to something traversing the line in a certain direction, that is to say, it involves a tacit correlation

¹ As Reid pointed out in his *Essay on the Intellectual Powers*.

² Broad, *Scientific Thought*, p. 54.

with a series of events in Time. Similarly the spatial term "here" is useless for defining the present, for it involves both a subjective reference which varies with those who use it, and it further involves "now", that is to say, time, present time. "Hereness" is no help to define "presentness", for it implies it.

Any series of events has a certain intrinsic order and intrinsic sense. Points on a straight line possess the first quality, but not the second, that is, they have an intrinsic order but not an intrinsic sense. One point is before or after another from one end of the line or the other. The order may be reversed. An intrinsic sense is only given to the points by consideration of some moving body traversing the line of points reaching A before B, B before C, and so on. This means the introduction of events and of time, and *the drawing* of our line or the indication of motion by an arrow:



The sense of the line, the before-and-after quality of the points, their successiveness, cannot be used as an analogy for Time. The truth is rather that the time sequence of events which possesses at once intrinsic order and intrinsic sense gives sense to the line, a view with which Alexander would agree.

The intrinsic sense of a series of events is essentially bound up with the *passage* of the said events, or, in general terms, it is intimately related, not only to successiveness, but to our use of the distinctions we term past, present, and future. A is before B because A is past and B is present; or the arrival, creation, or appearance of the new event B on the scene makes A past, no longer present, no longer perceived but remembered.

There are certain dangers to be avoided in this connection. One of these is the tendency to look upon the world as possessing a fixed order of events eternally arranged, and then to picture (as Broad well puts it) the characteristic of *presentness* as moving along this line in the way that a policeman's bull's-eye traverses the fronts of the houses in a street.¹ The houses which have been illuminated and are now in darkness are the past. The present is the round spot illuminated by the lamp and having a certain area, breadth, or extension, as indicated in the specious present.

¹ Broad, *Scientific Thought*, p. 59 (*italics mine*).

Our present is always a bit of history, a slab of duration, never a mere point. The houses not yet illuminated by the lamp are representative of the future.¹

But the row of houses cannot represent events. The houses have an intrinsic order, it is true, but they have no intrinsic sense. Sense only comes in with the movement of the lamp. One house is adjacent to another, that is the houses manifest a certain order. But one house is illuminated or passed before another—that is to say, sense is given by the motion of the lamp in a given direction. It must, however, be carefully borne in mind that the occurrence of presentness, falling now on one event and then on another, *is itself an event* and one of primary importance, for it must be a fundamental part of the total series of events. To overlook this is to overlook the real problem of the nature of Time.

Events have both intrinsic order and intrinsic sense. If they had not in themselves an intrinsic sense we could not say that the characteristic of presentness flashed on them in a certain fixed direction. The village policeman with his bull's-eye does not really help us, for what we are concerned with is not the row of houses, but the illumination of these by the movement of the bull's-eye.²

With regard to events being future, present, and past, it must be noted that it is precisely here that the paradoxical character of Time lies. For every event has these characteristics, sometime it was not yet, then it occurred, and was thereafter past and gone for ever. Yet past, present, and future are predicates which are exclusive and incompatible with each other. McTaggart, in an argument to prove time unreal, as we shall have cause to note, says they contradict each other, but this is not true. Yet it must be admitted that events alter with regard to these qualities of futurity, presentness, and pastness. The alteration or change of events in this respect is a highly

¹ This appears to be Dunne's view as given in his discussion on pp. 117-21 of *An Experiment with Time*. He disagrees emphatically with Broad's conception and Bergson's view of the future (which last he mentions). For him future events exist and are knowable to the dream mind.

² The moving present is the essential feature of Time—in fact, Time is constituted by this moving present. We must admit, however, that we also apply the term Time to the direction or dimension of this movement. If we did not admit this then Time would be merely the present, a limitation which is invalid and absurd. Cf. our discussion in Chap. VII, Sec. 4.

important point. Can an event change, or is change confined to objects or things? Events pass, said Whitehead; they do not change. Yet an event which is present becomes past. An event imagined or dreamed may become actual. Is this change? We must ask this question, and if it is so, then we must ask if it be change in the same sense in which we speak of the change in an object or thing.

Time is bound up with change. It implies essentially a *series* of happenings, a succession of *events*. One event is real after the other and the series has a certain direction which is *irreversible*.¹ Equally it implies a continuity or duration in which these events occur. There must be a certain unity about them to give us the unity we know as an event, a unity in difference. The spatial event possesses a certain continuity in time by virtue of its being motion or change of position of objects in space. The psychic event is discontinuous, discrete, and the time-life of the soul cannot be measured in the quantitative manner employed in relation to motion. A change which affects one object and its own qualities has been described by Windelband as an "immanent event", but one which involves the clash of or interaction of objects, be they billiard balls or minds, is a "transgredient event".²

Tennyson, referring to an experience of insomnia, speaks of his being aware "of Time flowing in the night". This likening of Time to an ever-rolling stream is no mere poetic metaphor. Fluidity or flow is a fundamental characteristic of Time. It involves succession, it implies an order of one thing, then another. Hence it involves change. Apart from change we should not be aware of time. We believe ourselves to understand change in things, but to talk of *events* changing seems almost unintelligible. Broad here is in agreement with Whitehead's remarks on the same point.

Yet events seem to change with reference to such characteristics as past, present, and future. But "can we treat the change of an *event* in respect to its temporal qualities as just

¹ This is true however much the perceptions be reversible according to circumstance and position of the observer.

² Windelband uses this distinction in his *Introduction to Philosophy*. Some thinkers would include as a transgredient event the interaction of soul and body, but this involves a discussion of the problem of the relation of soul and body, which is not in place here.

like the change of a thing with respect to qualities like red and green?" We must, says Broad, answer this question in the negative. The attempt would be circular because the change of things will be found, on further analysis, to involve the change of events in respect to their temporal characteristics. This becomes glaringly apparent if we put it, "The changes of things are changes *in* Time, but the change of events or of moments from future, through present to past, is a change *of* Time. We can hardly expect to reduce changes of Time to changes in Time, since Time would then need another Time to change in, and so on to infinity".¹

The problem of change lies at the basis of any representation of Time.² Time is a factor in the flow of our experience. Our whole awareness of time is as a function of change. We have no conception of Time which is absolute or Time in itself. We cannot perceive "empty Time". Our experience of time is relative to events, physical and mental. Change is involved in all the successiveness and transience of time, but change, in spite of Bergson, involves something which changes, i.e. it implies permanence. A person changes in a couple of years, the world changes, but neither becomes another person or thing. Even Mr. Lloyd George is the same Mr. Lloyd George as existed and spoke on important questions ten years ago. The world has lately seen revolutions and wars, but it is the same old world a step farther on *in its history*.

The truth is, as Broad rightly claims, that we employ the term change ambiguously. Some there are, like Bergson, who would assert that change is an immediate datum of consciousness, a fundamental feature of our experience which, just because it is fundamental, is incapable of definition. This may be so, but need not prevent us from differentiating in our use of the term which we persist in applying to several distinct kinds of fact.

The ancients, we may note in passing, spoke of a change as *τό γίνεσθαι*, and they were much preoccupied with the antithesis and relations of Being and Becoming or, in modern terms, relations between the thing and the event. Becoming is one type of event or happening, but it does not include all

¹ Broad, *Scientific Thought*, p. 65.

² Cf. Adamson in his *Development of Modern Philosophy*, I, V. 2.

change. Becoming means that something *new* appears, that is to say, something appears which was not there before. Change also implies that something which previously was there is not now present. Herbart attempted to classify types of change for which the Greeks used the term μεταβολή as being change of place or movement (περιφορά or κίνησις) or a change of properties or qualities (ἀλλοίωσις).

If we analyze carefully our use of the term change, it will be found that we employ it ambiguously. Broad correctly distinguishes three senses: of (a) change in attributes; (b) change in events from present to past; (c) change from future to present. To these we may add another, that of motion, or change of place. We thus get four distinct meanings of the term.

1. Alteration of quality in an object.
2. Change of place of a thing by motion.
3. The conclusion of an event or cessation of a continued existence of some kind. This is what happens when an object ceases to be present, becomes past, and is not recoverable in perception, but only in memory.
4. The occurrence of a new event.

To this fourth fundamental type the others are intimately related. They depend on it. For the third type of change mentioned above, that of an event changing from present to past, depends clearly on the fact that the totality of existence has increased. The same can be shown with regard to the first type of change, that of alteration in the attributes of things. A red object becomes green, that is to say, a red period of its history is followed by a green period. This obviously implies that there was a time when the totality of existence included the red history of our particular object, but did not contain its green history. It further implies that there was a subsequent time when the totality of existence included in addition the green history. That is to say, it implies the coming into existence of events.

This fundamental feature of the universe is better denoted by a term different from that used for the other occurrences. It is a great mistake to conglomerate them altogether in a vague and ambiguous term "Change". If we use the term "Change" for this fundamental feature of our universe, the production or

creation of new events, then we should speak of the other "changes" as alterations. It will probably be clearer, however, to reserve "Change" for senses 1, 2, and 3 of our list and abandon it altogether for number 4. When we talk of 1, 2, and 3—that is to say, when we speak of a thing changing in quality or position or an event changing from present to past—we are speaking of entities already within the totality of existence. They exist both before and after the time of the change. In the fourth case we refer to an entirely different process. Here we are dealing not with Change, but with Becoming. When an event becomes, it comes into the totality of existence. More simply, it comes into being, into existence; it *is*. It is important to note, however, that until it had *become* it was nothing at all.¹

We may note before leaving this point that the analysis brings out the significance of the supreme paradox of the philosophy of Change. Bergson says, in his lectures *La Perception du Changement*, that the final reality is Change. There is no permanence, there are no things that change. Now, in regard to the last meaning of Change which we give as becoming or creativeness, it is important that this should be stressed. One of the main features of the universe is this eternal becoming, this *évolution créatrice*. But this becoming is not the only type of change. Things, when they have become, change in the first, second, and third senses. They alter in quality, in position, and in pastness, but all of these changes imply permanence and are not incompatible with it. Bergson seems to have let his enthusiasm for newness, creativeness, run away with him. Further, change in his sense cannot be the fundamental feature of the Universe, for the fourth sense of the term is inapplicable to the Universe itself.² It already exists, it is not itself to come into being. It is and it changes in the first sense. Its qualities change and this sense of the term also implies permanence. This means that Time is in it, but it is not itself in Time.

The change of objects involves the change of events or *transience* of events, i.e. change of their temporal characteristics. Changes of objects are changes in Time. Change of events is a

¹ This is a view with which, e.g., Dunne emphatically disagrees.

² As, e.g., Bosanquet has urged in his *Meeting of Extremes in Contemporary Philosophy*.

change or passage of Time. We cannot reduce changes in Time to the passage of Time.

Change is an experienced fact. When we say that something changes we imply a certain identity and a certain difference. In spite of the change or movement, there must be sufficient identity, sameness, or permanence for us to know that we are following the phases of the same object. There must be a difference (due to events) in one part of the history of that thing or object to constitute change. It need not be simply change of place. Movement is a less general concept than change and is restricted to change of place or position in space. Motion involves, however, not only change in space, but also a reference to time. We have already noted how certain thinkers, e.g. Descartes and Spinoza, unfortunately wrote about motion almost independently of time.

When we compare successive *sensa*, or compare sensible positions of objects in successive fields of perception, we frequently notice a difference and remark that the object has moved or changed. We experience more than this, however, for frequently we perceive change or movement directly; we see the object moving. The actual perception of change, as Bergson pointed out so concisely in his Oxford lectures, is unique. It cannot be described in other terms. To see an object actually moving is quite a different experience from merely noting that it *has* moved. At a glance we can see the second-hand of our watch in motion, going round, but we only see that its hour-hand has moved since we last took it from its pocket. In the two cases we are doing something quite different. In the one we are concerned with a comparison of the contents of two different fields of perception, while in the other we are concerned with an occurrence, an event within a single field of perception. Both Stout and Broad agree in asserting that we do have a unique perception of change. Not merely do we observe that something *has* moved or changed in quality; we frequently see it *moving* or *changing*. The two experiences are different and the second is of great importance in developing our conception of change and of time, especially our notion of time as continuous.¹

As a matter of fact, in order to be directly experienced by us,

¹ *La Perception du Changement*, Oxford, 1911.

a change must exceed a certain rate or speed. If a change occurs very slowly then adjacent events are qualitatively very little different from each other, and it might be impossible for us to perceive the change directly although we might note that it has taken place. This would occur where events with any perceptible difference for us were separated by an interval longer than our specious present. This interval which, under normal conditions, is fairly constant in mankind, is far too short to include within itself most events with which we are normally concerned. It is, of course, a vastly longer interval than that taken up by many events which interest the scientist, e.g. vibrations such as *light-waves* or vibrations of electrons.

A point arises as to how much qualitative difference we can allow between successive slices of a long event before it ceases to be appropriate to call the whole event the history of so-and-so. This question, as Broad rightly confesses, admits of various answers, but it is impossible to hold that a thing only remains the same thing if it does not change. All objects as they endure in time have a history, whether it be "exciting" or not. It may be very dull and uniform, but it is no less true that duration in time is the history of any object. An object which had no history could not exist. In a sense it is what Broad calls "strands of history that do exist". It is because of such strands that we talk of objects at all. No object is without a history or a time-duration. To say it has only spatial dimensions is an abstraction which entirely overlooks its existence in Time. When we say that an object is unchanging we mean it is "*a completely uniform strand of history*". To say that a certain object has moved, but has not otherwise changed, is to say that the positional qualities of successive slices of a certain strand are progressively different. A moving object is, therefore, a *positionally non-uniform strand*.¹ If we refuse to identify an object with its whole history or duration in time then either we must identify it with a *momentary section* of that history or with a *uniform section* of it. If we do the former, the object is a mere abstraction incapable of existence, if we do the latter then our procedure is entirely arbitrary. Broad considers that *within the restricted realm of sense-perception* a motion like that of a shooting star is an absolute motion, which is not merely a change of relation, and in this he finds the

¹ Broad, *Scientific Thought*, p. 408.

origin of the concept of absolute motion, which is fallacious if applied beyond that restricted realm.

"A thing", according to Broad, "is simply a long event, throughout the course of which there is either qualitative similarity or continuous qualitative change, together with a characteristic spatio-temporal unity." A sense-object is hardly to be called a "thing", for, although it is an example of a long event, it is not physical. Thus Broad rightly maintains that the dividing line between events and things cannot be very sharply drawn in theory, but of course we do make a rough distinction for practical purposes, and in order not to depart too far from common usage. This admittance about events and things recalls Whitehead's difficulties and changes of view in regard to the relation of event and object. Broad sees the difficulty, but corrects the more rigorous tendency in Whitehead to draw an absolute line of distinction between the two. Whitehead, like Broad, finds that the line between events and things cannot always in theory be drawn definitely. A thing is a long event, and any object is inseparable from its history. Indeed, it is an object precisely because it has a history. It is not a mere point in time; it is a line in time. Even the flash of light may "last" for thousands of years as a perceptible event for different observers. It may be seen centuries after the source of the light has completely disappeared. A thing moving very quickly may appear merely as a flash of light, while an observer travelling in a certain direction at great speed might take a flash to be a "thing".

By the study of perceptible events we infer the existence of events we cannot see or perceive at all. The relations of perceptible events to each other are complex and are divided into the relations of imperceptible events, or what Broad, with Whitehead, calls "scientific events", to each other, and the relation of these to perceptible events of which we are aware in ordinary life. A flash of light is a perceptible event, but the motion of electrons and of the ether-medium are events of a scientific or imperceptible kind. They are parts, the unseen parts, of the perceptible event which the physicist examines. This notion is necessary in view of the movements of electrons and such changes in nature as are directly imperceptible to us, which we infer from the perceived parts of perceptible events.

We are forced to believe that there are external processes of change connected with our visual sense histories. Broad gives adequate reasons in detail for this and for the fact with which Kant unsatisfactorily wrestled in his *Analogies of Experience*, and Sigwart after him, namely, that we do not take the time of our perceptions to be the time of objective events.¹ We assert physical co-existence on a basis of sensible succession, not entirely on the grounds which Kant suggested, for many of his arguments are false, but on the ground of calculation and the view that objects are enduring strands of history which exist independently of our perceiving them. "I do not profess", says Broad, "to be able to *prove* that such assumptions are *even* true . . . but we can neither refute this assumption, get rid of it in practice, nor stir a step without it."²

The event is the sign of Becoming, of Change, and the arrival of new events puts those which have already taken place into a new relation. If we have a row of five oranges, the addition of a sixth involves a change of relation. The last orange is no longer in this position. It may not have changed qualitatively in itself, nor has it changed its order or relation to the one which preceded it. Again, if James is a young boy, he is changing qualitatively, e.g. growing taller and stronger. He may be at the age of four the youngest son of his father. But subsequently another son is born and James ceases to be the youngest son, because of the new event. This change is quite different from his growing taller, it is the fundamental type of change, the becoming, the creative advance within the Universe.

Broad considers that when an event which was present becomes past it does not change or lose any of the relations which it had before; it simply acquires in addition new relations which it *could* not have had before, because the terms of the time-series to which it now has these relations were then simply non-entities. Such a theory accepts the reality of the present and of the past, but asserts that the future is simply a non-entity. He claims that nothing has happened to the present by

¹ Broad, on *Kant's Analogies of Experience*. Paper to the Aristotelian Society, 1926. We have followed the line of several of these arguments by Broad in dealing with the Analogies in our chapter on Kant, but Broad rather tends to overlook the points stressed in our summing up on Kant and Schopenhauer.

² Id., *Scientific Thought*, p. 425.

becoming past except that fresh slices of existence have been added to the total history of the world, and so the past is as real as the present.¹ According to him "the essence of a present event is, not that it precedes future events, but that there is quite literally *nothing* to which it has the relation of precedence."² These two statements we shall examine presently.

It is the fact that the sum-total of existence is always increasing which gives the time-series a sense as well as an order. A moment t is later than a moment t' if the sum total of existence at t includes the sum total of existence at t' together with something more. Broad stresses the change element in the Universe, and insists that the fundamental feature of that Universe is its ability to bring new events into being, and this is as it were the *raison d'être* of Time.

Judgments which profess to be about the future do not, in Broad's opinion, refer to any fact, positive or negative, at the time when they are made. They are therefore, at that time, neither true nor false, but will only become true or false when there is a fact for them to refer to (and they will then remain eternally true or false). Nevertheless, he admits that, although the future is nothing, and although judgments which profess to be about future events actually *refer* to nothing, they are not *about* nothing, for they are about some characteristic and about *Becoming*.³ Broad objects (in reference to a doctrine of McTaggart, which we shall examine in our next section) to the statement that any event has the characteristic of futurity.

There is nothing contradictory or illogical, as McTaggart asserts that there is, in the change of events in their becoming present and becoming past. This is the fundamental change which is the basis of Time. "I do not think", says Broad firmly, "that the laws of logic have anything to say against this kind of change; and, if they have, so much the worse for the laws of logic, for it is certainly a fact. What the laws of identity,

¹ Surely something happens through this addition, or something which permits this addition. This something being the "passing away" feature of the present into the past. There is a continuous "coming into being and passing away" (as the Greeks put it), and the former involves the latter in that continuous change of events or Time.

² Broad, *Scientific Thought*, p. 66.

³ We may only speak of them as judgments if we do not confine judgments to mean propositions which are either true or false at the time they are stated.

contradiction, and excluded middle, between them assert, is that any proposition is either true or false, cannot be both and cannot alter in this respect. They do not assert (and, if they do, they must be amended) that the *number* of propositions is eternally fixed; they only assert that it cannot be diminished. But it may be increased, and it *is* continually increased by the process of becoming, which continually augments the sum total of existence and, thereby, the sum total of positive and negative facts. Or, to put it in another way, the laws of logic apply to a fixed universe of discourse, and we can at any moment get a fixed universe of discourse by taking the sum total of reality up to that moment. But the universe of actual fact is continually increasing through the becoming of fresh events; and changes in truth, which are mere increases in the *number of truths* through this cause, are logically unobjectionable."¹

He claims that nothing that has ever existed really ceases to exist. The parts of its history that have become merely recede into the more and more distant past and nothing, he points out, that henceforward becomes is of such a nature that it adds on to these past events to make a continuation of *that particular* sense-object. It were, therefore, less misleading, he suggests, to say that "the sense-object in question ceases to *persist*. The past, like the unhappy Theseus, '*Sedet, aeternumque sedebit*'".² The Battle of Marathon will always precede the Battle of Hastings as both precede the Battle of Waterloo. Each of these battles was at some time present and was contemporary with assertions made about it. Now that they are past, they precede any assertions made about them by ourselves or our contemporaries. Their temporal relations to each other, however far they recede from us, remain fixed and unalterable.

Broad further points out that while the Battle of Waterloo was future to persons participating in the Battle of Hastings, and while we can consider the futurity of the Battle of Waterloo relative to that of Hastings, this is only because they are both past for us, they have both occurred. To say that future events (i.e. future to a given present) become present and then past is a true but often valueless statement, and usually an impossible

¹ Broad, *Scientific Thought*, p. 83.

² Ibid., p. 347. Horace, in one of his *Odes*, rejoices that Jove himself cannot alter the past. *Odes*, Bk. III.

one, for we cannot know or foresee in any case the events which are to become present.¹

If we were to imagine with Broad, an observer whose specious present covered the whole of his life history,² we would note that the distinctions of past, present, and future would still hold for him. His distinction between present and future would be like ours, but his distinction between past and present would not be like ours at all. His whole past history would be present to him in his specious present along with the latest happenings. This is especially interesting because it is the way we *conceive* our own life history, but we do not perceive it thus. A Deity with whom there is no forgetting and remembering would be such an observer. He does not "remember" because he perceives and knows the past in his specious present or great enduring Now. The point is hypothetical and perhaps not worth discussing, but, however he knew or saw the past, there would presumably be for him a distinction between the objective past and the objective present, but Broad does not note this. Taylor does not think that there are future facts outside God's knowledge or that the admission of freedom and contingency precludes this.³ Similarly, Sorley, in *Moral Values and the Idea of God*, sees no inconsistency in maintaining freedom of choice for individuals and God's absolute knowledge of the future, on the plea that this divine knowledge does not involve divine determinism.⁴ We may contrast with this opinion that of Webb, who claims, with Croce, that the detail of the future cannot, from the very nature of the case, be foreseen or seen by the anticipating mind.⁵

¹ Cf. Bergson's lecture at Oxford in 1920 on *Prévision et Nouveauté*, where he wittily and pertinently dealt with this point by remarking that if he really *knew* what the successful play of next year would be he would write it himself. Dunne claims, however, that if we explore the dream realm more carefully we shall find that half of our dream-content is of the future. Cf. also Osty, *Supernormal Faculties in Man*.

² A note is needed here. "Up to the present" must be added. Broad did not intend us to consider a being who knew *all* his life history, future as well. This is clear from other sections of his work.

³ A. E. Taylor, *Elements of Metaphysics*.

⁴ Sorley, *Moral Values and the Idea of God*, p. 472.

⁵ Webb, *God and Personality*, 1918, p. 202. On Croce's view that the future course of History cannot be foreseen, for the detail of progress must be first *enacted* before it can be known, *Filosofia della Pratica*, p. 314 (English translation, p. 450). Dunne (in *An Experiment with Time*) discusses the same problems in the light of his own theory. Cf. also work of Osty and Flammarion.

Broad asserts that there is no incompatibility between the two assertions:—

1. That at a certain moment t_1 God can have a state of mind whose immediate object is the volition of a man at some later moment t_2 .
2. That no amount of knowledge of events before t_2 would enable Him to *infer* the volition at t_2 .

He refers to memory in this connection, and argues that in the light of memory the statements cease to be either incompatible or paradoxical because we can remember much that we do not infer. In effect this is equivalent to claiming that there is no essential difference between past-and-present and the future, save that we have not come up with the future or that it has not yet reached us. This statement appears inconsistent with his theory of the non-entity of the future.

If God sees or knows *everything* (including what is for us the future), this must include his knowing the distinction *we* make between past, present, and future. He must, if he knows *everything*, know whether a thing has happened for us, i.e. whether it be in our future, our present, or our past. Taylor objects to "the plausible attempt" to solve the problem by simply thinking of the whole physical order as forming a "specious present" to the Absolute Experience. Against this he urges that the "specious present" itself always consists for us of a multiplicity of detail, which we apprehend as simultaneous without any insight into its inner unity as the embodiment of coherent system. Hence, he argues that such analogy between the Absolute Experience and the "man with the specious present immensely great" is fallacious, for the direct insight of the Absolute Experience into its own internal meaning or structure cannot be adequately thought of as mere simultaneous awareness of the detail of existence. So long as a succession is merely apprehended as simultaneous its meaning is not grasped.¹ Presumably the Absolute, if it is Experience,

¹ Taylor, *Elements of Metaphysics*, p. 264. McGilvary, in an article, "Time and the Experience of Time" (*Philosophical Review*, March 1924), contrasts the Absolute time experience and ours. He claims that the Absolute cannot really experience Time. For him events stand in an order, while for us they come, and their coming, their happening, is often sudden or tragic, unforeseen by us. "Our weakness somehow shapes the shadow, Time." From this finite point of view the crises of life

contemplates its own meaning and structure, and this involves much more than is contained in our "specious present", which is merely perceptual in character, involving no reflection or meaning, which can only come later as a higher activity. We may thus leave the hypothetical problem of a Being with an immense specious present, calling attention to our previous remark on this point in dealing with Lotze,¹ and return to more concrete difficulties about our own time relations such as the correct timing of events, a problem which Broad discusses in considerable detail.

When we deal with temporal relations and try to state the conditions under which two "sensa" in different sense-histories are said to be contemporary, we are not defining a new sense of the term "simultaneity", we are only giving a new test by which the fact of simultaneity, in the old sense of the term, can be established in cases where it cannot be directly sensed. The difficulties in the determination of simultaneity were discussed by us, not only in relation to the Theory of Relativity, but in the discussion of Kant, who, in spite of the unsatisfactory nature of his conclusion, did at least see the problem and formulate it. That problem was how we make the distinction between the subjective time-order in which we perceive events and the objective order of those events of which they are the perceptions.

Broad would agree with Sigwart in his view that "All time-determination starts first from the assumption that the objective sequence of changes in objects corresponds to the subjective sequence of those changes as perceived. This assumption continues so long as it does not lead to contradictions; where it leads to contradictions it is not immediately abandoned, but further assumptions are based upon it concerning the time-relations between event and perception by which these are connected with varying conditions, and the assumptions are continually modified until all the data agree. Thus the whole

to which McGilvary refers are pregnant enough, but they are characteristic of our human consciousness with its finitude and limitation. Expectation, hope, longing, fear and dread, anxiety, are experiences of which the Absolute has no inkling. To see all at once is to fail to feel the temporal sequence as genuinely temporal.

¹ See above, in Chapter IV, footnote where Laird's comment is given, pp. 145-6; also compare discussion in Chapter III under Reid, p. 77.

process is hypothetical; we modify our original and unpremeditated assumptions, and find a guarantee for the correctness of the proceeding neither in immediate empirical observation, nor in an *a priori* principle (for which, in the generality in which Kant states it, we should have no rules of application), but in the agreement of all the consequences which follow from our hypotheses."¹ "If an objective time-determination is possible only under assumptions which represent the sequence of subjective perception as depending according to law upon the sequence of events, then these assumptions must themselves harmonize with those causal laws of phenomena which are grounded upon them, and must rank merely as a part of the causal laws by which we interpret the course of events and endeavour to know them as necessary. For in so far as our own perception must be regarded as merely a part of the general causal connection and as manifoldly conditioned by it, the aim of our investigation is to represent that which enters into our perceptions as a result of a system of laws (uniformity) connecting all events; and there is no doubt that in detail the particular values of time-determinations which we ground upon the subjective perception of inner events are subject to subsequent corrections, although the basis upon which we rely must have some claim to objective validity before we can even try to establish universal causal laws about phenomena."²

The notion of "date" only becomes perfectly definite when we deal with "momentary" events, as Broad calls them. For this purpose resort must be had to Wiener and Whitehead's method of Extensive Abstraction. By this and other methods of calculation dates which are neutral as between different observers (i.e. objective) can be established.

Neutral simultaneity, as Broad argues in some detail, is not merely an extension of sensible simultaneity. He shows the difficulty of arriving at neutral simultaneity in the case of sound, and shows how we must introduce spatial measurement and the notion of influences travelling out from sources with a finite velocity. He offers the following definition of neutral simultaneity. Two *sensa* belonging to different sense-histories are neutrally contemporary, if (1) they are two visual *sensa* of a

¹ Sigwart, *Logic*, Vol. II, p. 252.

² *Ibid.*, Vol. II, p. 251.

group which constitutes a single flash; or (2) are respectively sensibly simultaneous with two visual sensa which belong to such a group. "There is", he thinks, "no doubt that this is the way of determining neutral simultaneity, with which we all work in practice, except in extremely delicate scientific investigations, or in cases where distances of astronomical order of magnitude are under discussion. Nevertheless, we all know that no scientist would accept it as ultimately satisfactory. He would point to the facts which are alleged to prove that light travels with a finite velocity, as a conclusive objection to the definition. The assertion that light travels with a finite velocity implies, *inter alia*, that there is an extremely important sense in which the various sensa of observers in different places who see the same flash are not simultaneous but successive. The above definition of neutral simultaneity is, therefore, unsatisfactory, because it leads us to call sensa simultaneous, which are in some very important, but as yet undefined, sense successive."¹

There are two things to be said in favour of this definition. It is not circular, and it does not *directly* conflict with our judgments about sensible temporal relations, as an attempted auditory definition did. It would, of course, be circular if we could not define what we mean by "the same flash" without introducing temporal relations between sensa in different sense-histories. But Broad considers that we can define "the same flash" without this. "A number of observers may be said to see the same flash when the following conditions are fulfilled: (1) Each is aware of a *single* outstanding visual sensum of very short duration; (2) These sensa are all qualitatively very much alike; (3) They are all optically compresent at a common centre."² There is nothing in our light-experiences to correspond to the case of two distant observers hearing two bells, and one of them finding his auditory sensa sensibly contemporaneous, and the other finding the auditory sensa belonging to the two noises sensibly successive. We can only deal with pairs of observers separated by distances of a few miles; and for such distances there is no conflict between sensible temporal relations and neutral temporal relations as determined by

¹ Broad, *Scientific Thought*, p. 375.

² *Ibid.*, p. 374.

light-signals.¹ It is, therefore, possible to determine neutral simultaneity visually without involving ourselves in a circular argument and without conflict with any judgments of sensible simultaneity that we can make. The conflict is with the facts that prove that light has a finite velocity. "If", says Broad, "I want to determine neutral temporal relations between an event which is in my sense-history but not in yours, and an event which is in your sense-history but not in mine, the only possible way seems to be to find something which is common to the sense-histories of both of us and to determine the neutral temporal relations between the two 'private' events by means of their respective sensible relations to this public 'event'. Now there are events like flashes and noises which are public, and it would be easy to determine neutral simultaneity if it were true that when we say we 'hear the same noise' or 'see the same flash', there is a single auditory or visual sensum in all our sense-histories. We could hold this to be a fact of simultaneity and not a definition of a new kind of relation." But he adds: "Although it is not *logically* impossible that a single sensum might be in a number of different sense-histories, closer observation of the facts makes it almost impossible to believe that a noise or a flash really is the same sensum. Moreover, it seems impossible to hold that it is even a group of *contemporary* sensa. Thus, such methods of determination, though *practically useful for most purposes*, owing to the considerable velocity of sounds and the very great velocity of light, are not theoretically satisfactory."²

The finite velocity of light is never proved *directly*, but always by the argument that if it be not true certain observable facts will not be reconcilable with well verified laws about the *motion of matter*. The only way out of this difficulty would be if both observers could observe a certain pair of flashes, and if one of them should find that his two visual sensa were sensibly simultaneous, and the other should find that his two visual sensa were sensibly successive. But, in practice, this cannot be done, because of the great velocity of light, and the fact that the only observers who can compare notes with each other are confined to the earth's surface. Thus it seems clear

¹ Broad, *Scientific Thought*, pp. 375-6.

² *Ibid.*, p. 386.

that the neutral simultaneity of visual sensa belonging to the same flash is denied wholly and solely because it conflicts with another system of dating which depends on certain alleged laws of motion.¹

Different observers, according to their motion, might see a flash as a perceptible thing, others merely as a perceptible event. It is, therefore, necessary to distinguish between the duration of an optical object from a place, and the total duration of an optical object. The former is simply the duration of the sensible object, which is the appearance to an observer at that place. But an optical object, however brief its duration from any one place, has an enormously extended duration if we take into account *all* the sensa with reference to different places or all places. Its total duration is the time which elapses from the earliest to the latest of these, and this, even for one flash, may cover a million years. One writer, De Sitter, estimated that such a flash endures in this sense for a hundred million years. A persistent optical object would, however, possess both kinds of duration.

We are not justified in equating the time of our perceptions with the time of physical events, without considerable calculations. A star that we "see" may have disappeared centuries ago, and we continue to see its light long after it has been cut off at the source. Again, there are many events too rapid for our perceptual powers to perceive at all, and on this point Whitehead, as well as Broad, lays great stress. The time of atoms and vibrations is not known to our unaided perception.

In the problem of measurement of time we must consider it in relation to space. This does not mean that there is no difference between temporal and spatial relations, but it does mean that *for the purposes of measurement* it is impossible to date the events of nature in a single Time-order without referring, through motion, to space, and this is one of the features of the Theory of Relativity. The distinction between spatial and temporal relations, however, is not, and cannot be, obliterated. Broad refers to a statement that the Special Theory of Relativity broke down the distinction between Space and Time and that the General Theory broke down the distinction between both and matter. To this he objects that the first

¹ Broad, *Scientific Thought*, p. 384.

statement is "very loose, since the distinction between spatial and temporal isolation remains for every observer." The *Special Theory does not break down the distinction of Space and Time*, but only their isolation, which is quite a different matter. This is a highly important point. The second statement he regards as true, for the General Theory does break down the distinction between Space-Time and *events*. As Whitehead has shown, Space-Time is the continuum of events; they are its structure, or alternatively, it is their organization in a total scheme for all observers. It is evident that it might be possible to regard the physical world as forming a spatio-temporal whole analogous in general outline to a single sense-history, and yet that we might have to postulate differences of detail.¹ Having got rid of the absolute theories of Space and of Time, we must not introduce them again for Space-Time.² As against Alexander, Broad, while insisting on the reality of this fundamental change of the Universe, does not consider it to be due to Space-Time as a kind of matrix. For him Space-Time is a physical system of events, but it no more creates events than the framework or organization of an army creates wars. Broad likens Space-Time to the organization of an army and considers that anyone is justified in such an analogy.³ "But if this led him to suppose that the organizations whose structure he is describing were substances that existed side by side with the soldiers, he would be talking nonsense; and it would be the same kind of nonsense as is talked by people who imagine Space-Time to be an existent substance which pushes and pulls bits of matter about. It must, therefore, be clearly understood that, when we talk of the geo-chronometry of Space-Time, we are simply describing certain very general and abstract structural features of that whole which is the physical world."⁴ When we talk of the properties of physical Space-Time we are simply enumerating certain very general structural characteristics of that spatio-temporal whole which is the physical world. The only existent under discussion is this whole, which is composed of scientific events bound together in a characteristic unity by spatio-temporal relations.

¹ Broad, *Scientific Thought*, p. 456.

³ Id., *The Mind and its Place in Nature*, p. 190.

⁴ Id., *Scientific Thought*, p. 458.

² Ibid., p. 457.

Broad examines the Absolute and the Relational Theories of Time which have come down to us from the work of Newton and Leibnitz respectively. The question at issue between them is, if we take two events, e.g. the Battle of Hastings and the Battle of Waterloo, what is the nature of the temporal relation between the two? For the Relationalist this relation is simple, direct, and unanalysable, connecting the two events in question and nothing else. For the Absolutist, however, it is a complex compounded out of other relations which involve other terms in addition to the two events. On the Relational Theory there is not something called Time which could exist even if there were no events, for it is a theory that Time is nothing but the relations of before-and-after between events. The Absolutist Theory claims that there is something called Time which exists quite *apart from events* and which is characterized by a succession of moments. Events when they occur happen *at* particular moments of this Absolute Time, and are so dated.

Both these Theories agree that there is one, and only one, temporal relation between these two events and that both events have a fixed position in time or date, with a certain time-lapse (in this case 729 years) between them. The Theory of Relativity differs from both the Relational and the Absolute Theory in denying that there is a single absolute interval of time between the events.

As between the Absolute and Relational Theories many interesting arguments are suggested (apart from those primarily concerning motion) which indirectly affect our view of Time. For instance, there is no conclusive evidence that moments exist. When *events* are close enough to each other to come within that brief span which psychologists term the specious present, we can and do directly observe the temporal relation between them, but we never observe moments, and they never themselves do anything or produce any measurable or sensible effects at all. On the other hand, we do observe a quantity of time and it is insufficient to assert that Time is merely the relations of events. The relations are always in Time, and Time consists of the continuous change or becoming of the universe. This is a concrete fact, not merely a relation; it is the fact, moreover, which makes temporal relations between events possible and evident, and it underlies them all, imparting

a definite sense or direction to events according to the order of their becoming. This order is not merely a relational order which is reversible, it is a concrete order which is irreversible. Broad, therefore, concludes that "so long as this absolute feature of Time is recognized there seems no objection to the Relative (or Relational) Theory as such".¹ More frankly he might say that, as it stands, we cannot accept the Relative (or Relational) Theory, for we cannot agree that time is merely a relation and nothing more. We entirely agree with his further remark that, if the Relative (or Relational) Theory has to be rejected, it will not be in favour of the Absolute Theory. The truth is, as we shall maintain in our conclusion, that neither of these theories is a true and adequate description of the nature of Time. They are not the only possible alternatives, nor are we thereby forced to admit that the Theory of Relativity replaces either of them, for it is concerned only with the problem of measurement, not with the metaphysical question of the nature of Time as such.

The Relational Theory of time is frequently presented in a loose and half complete manner, and even the Relativist quite inconsistently talks about moments so carelessly that he almost expresses a belief in the entities he really denies. If he uses the word at all he should clearly point out that by the term he means a class of contemporary events occupying an infinitesimal portion of time, and this, of course, is not at all what the Absolutist means by a moment.²

Broad's whole treatment of the problem of Time is penetrating and stimulating. There are, however, certain difficulties about the definition of past, present, and future which present themselves in any theory of Time, and Broad's treatment does not escape them. Some of them are, indeed, intensified by his particular definitions and his attitude to the character of the future.

If a given event is present relative to one total momentary experience, it is never past relative to that experience. According

¹ Broad, *Scientific Thought*, p. 91.

² Broad suggests in *Scientific Thought* (p. 92) that a moment is a class of contemporary momentary events, but this practically contains the word to be defined. The obligation on the Relationist is to define moments in terms consistent with his theory or drop the use of "moments" entirely.

to Broad, a present event is one which is not succeeded by anything. A future event, according to Broad, is not one which succeeds the present. A future event is a non-entity, and the present is present just because it is not succeeded by any other event. If we say that future events succeed present events, we are guilty of making them succeed that which has no successor, which is contradictory.

On Broad's view, when an event which was present becomes past, that event does not lose any of the relations it had previously, but acquires additional relations which are new, and which it could not have had previously, simply because the terms with which it now has these relations did not at that time exist. The sum-total of existence is always increasing, and it is this which gives the Time-series an intrinsic sense or direction. Time flows in one direction and it cannot flow backwards. While both spatial-series and Time-series have order, only the Time-series has intrinsic sense or direction. "The succession of events in time with their intrinsic senses is a datum of immediate experience", Broad claims. This perfectly legitimate claim really amounts to saying that we understand the relation of before-and-after because we grasp it in immediate experience, and, as it is a fundamental feature of all our perceptual experience, it is indefinable.

Broad states this quite clearly and then goes on to elaborate his view in a curious and, in some respects, unnecessary manner. He appears to have some doubt as to our fundamental and immediate perception of the relation of before-and-after, although he has himself subscribed to it. Hence we find him announcing on the one hand the self-sufficiency of the doctrine that the succession of events in time, with their intrinsic sense, is a datum of immediate experience, and on the other hand claiming that we cannot understand what is meant by the statement that one event is earlier or later than another unless we have a correct view of the reality of the past, the present, and the future.

Now Broad claims that the correct view of these three is that the past is as real as the present, but that the future is not real, it is nothing. Judgments which profess to be about the future cannot be regarded as either true or false, or in other words, they are not genuine judgments at all, as they are

judgments which do not refer to anything, but are about some characteristic and becoming.

An essential characteristic of a present event is that there is literally nothing to which it has the relation of precedence. The future is a non-entity. Broad claims that the statement, A is past when B is present, or B is later than A, can only be understood in the light of the definitions he gives of past, present, and future, and in particular, of his theory of the non-existence of the future. This is not the case, and involves a recantation by Broad of his previously stated conviction that the relation of before-and-after is perfectly intelligible and is a datum of immediate experience. There is no need to appeal to any theory of the *future* in order to grasp the relation of before-and-after.

This relation is, indeed, a more fundamental one in our experience than any theory of the relation or reality of past, present, and future. We know which of two events is earlier quite independently of any theory about the future, or, for that matter, of the past. We know also the relation past, present, and future independently of any theory of the non-existence of the future. If we say an event is present at a given time, we mean it happens at that time; if we say it is past at a given time, we mean that it occurs earlier than anything which is happening at that given time; while if we say it is future at a given time, we mean that it occurs or can only occur later than anything happening at the given time. These statements are intelligible apart from any theory of the future. They are simple definitions based on the fundamental relation of before-and-after which is grasped immediately by experience, and is known to us prior to our making the more elaborate distinction of past, present, and future.

If we say that the intrinsic direction of the events of the time-series is essentially bound up with the distinction of past, present, and future, we must notice the ambiguity of the term "present". It may mean two distinct things. First, it may mean merely "present at any given time". This would include a past time, in which case the future relative to that present would be our past, and we could make judgments about such a future. Secondly, it may mean only "present at present", i.e. present in our "now". In this case the future, relative to

this now, will not have occurred, and some of Broad's strictures against the future will stand, although equally it might be claimed, for a different reason, that the past is non-existent.

Broad has brought out clearly the paradoxical character of temporal relation, by showing how (1) every event has the characteristics of past, present, and future, although these characteristics appear to be inconsistent with each other, (2) events change in course of time with respect to these characteristics. The second of these paradoxes arises in any attempt to avoid the first, and they have both been used by Idealist thinkers (e.g. McTaggart, as we shall see later) in order to assert the illusory character of all temporal experience. They have also been used by Realists, notably Russell, to support the view that the difference between past, present, and future can be resolved simply into differences in our cognitive relations to different events. We do not think, however, that the distinction can be explained merely in this way. There is an objective sequence in the happening of events which is distinct in character from our awareness of them. We are not aware of them until they happen, but their happening is not to be explained merely as a change in our cognitive relations to them. Something much more fundamental than that is involved. The creative advance of the universe brings new events into being. To regard the change as only a change in our cognitive relations to events is equivalent to asserting that the series of events has no intrinsic sense, but only acquires such a sense because the attribute of presentness moves along the series in a fixed direction. Such a view overlooks the fact that presentness is not merely a cognitive relation, not a mere presentation to a subject, it is the objective coming into being of events which had not until then happened.¹

Broad defines a present event as one that is succeeded by nothing. This is not as simple or unambiguous as it might appear. Obviously it does not mean exactly what it says, for in that case there would be an end of the time-series of events now and for ever. It might mean that no past events had ever been present, which is equally absurd and not likely to

¹ This is our objection to Dunne's view, but see later discussion of Future in last chapter. It is interesting to note that Dunne's claims apply only to *his* own mind, i.e. to his *own* future experiences.

be what Broad meant. More likely what he meant was not that a present event is one which is never to have a successor, but one which *at the time it happens* has no successor. This, however, although undoubtedly nearer to what Broad had in mind, would not be helpful, for it would apply to every event that has ever happened. If, again, we take it that Broad means by present event one which has up to now not been succeeded by another, or an event succeeded by no other at the time when it is asserted to be succeeded by no other, we are involved in saying in effect, that a present event is one which up to this present event has not been succeeded by another, and we are using the present to explain the present and are thus no further on in our definition. When he says that a present event is one which is succeeded by nothing, he must mean that an event present *at a given time* is one which is succeeded by nothing at that given time. But we must notice how little this really helps us to understand the sequence of past, present, and future events which is Time. To define an event as present at a given time does not help us to understand how all given times are not present. All events, in order to be happenings at all, have occurred some time—that is to say, all events have been or are present at some given time, but of these given times some are past, one is present at present, namely now. This is the vital distinction which Broad's definition does not reveal, for an event present at a given time is quite different from an event present now. In short, Broad, believing as he does in the reality of the past as still existing, fails to make clear to us in his statements the vital distinction of the past and the present, although he must be well aware of the distinction and would probably agree, in spite of his notion of the past as existing, with our maintaining the distinction as clearly as possible. We have noted the difficulty in Bergson about the ambiguity of the "past" and how Alexander rightly takes Bergson to task for a failure to distinguish the past from our awareness or memory of it.

Although Broad does not appear as helpful as we might expect with regard to the distinction of present and past, he is not as confused in his statements as the Pragmatists who, in their discussions of this topic, make some amazing pronouncements as we shall presently discover.

The Realist discussion of Time, however (apart from that of Alexander, which is peculiar, and that of Broad), is well set out by Russell in his *Knowledge of the External World* and in a special article on "The Experience of Time".¹ While Bergson endeavoured to solve the ancient paradoxes of Zeno by insisting on the irreducibility of motion and by criticizing the intellect for its static view of reality, Russell would solve these paradoxes in quite another manner, and he returns to some of the antinomies of Kant, whom he accuses of psychological superstitions. Russell argues that Zeno was substantially right, but that his paradoxes disappear with the treatment of the modern mathematician like Cantor and Dedekind. He discusses these puzzles at some length in his chapter on "The Problem of Infinity" in *Our Knowledge of the External World*.² In this he brings out the ambiguity of the term infinite, which may refer to ends or to divisibility. He shows that many of the ancients thought of a finite time as enclosing a finite number of instants.

Russell adopts in practice the Relational Theory, and strictly should deny moments or instants, but he actually leaves their existence as separate entities an open question.³ Instants are not among the data of experience, and if legitimate must be inferred or constructed and, as it is difficult to see how they can validly be inferred, they must be constructed. In this certain assumptions are involved, which Russell states:—

1. In order to secure that instants form a series, we assume:

- (a) No event wholly precedes itself. (An "event" is defined as whatever is simultaneous with something or other.)
- (b) If one event wholly precedes another, and the other wholly precedes a third, then the first wholly precedes the third.
- (c) If one event wholly precedes another, it is not simultaneous with it.
- (d) Of two events which are not simultaneous one must wholly precede the other.

¹ *The Monist*, 1915, pp. 212–23.

² Compare Broad's "Note on Achilles and the Tortoise" in *Mind*, Vol. XXII, p. 318.

³ Russell, *Our Knowledge of the External World* (2nd Ed. 1922), p. 147.

2. In order to secure that the initial contemporaries of a given event should form an instant, we assume:—

- (e) An event wholly after some contemporary of a given event is wholly after some *initial* contemporary of the given event.

3. In order to secure that the series of instants shall be compact, we assume:—

- (f) If one event wholly precedes another, there is an event wholly after the one and simultaneous with something wholly before the other.¹

“Instants may also be defined by means of the enclosure-relation, exactly as was done in the case of points. One object will be temporally enclosed by another when it is simultaneous with the other, but not before or after it. Whatever encloses temporally or is enclosed temporally we shall call an ‘event’. In order that the relation of temporal enclosure may be a ‘point-producer’, we require (1) that it should be transitive, i.e. that if one event encloses another, and the other a third, then the first encloses the third; (2) that every event encloses itself, but if one event encloses another different event, then the other does not enclose the one; (3) that given any set of events such that there is at least one event enclosed by all of them, then there is an event enclosing all that they all enclose, and itself enclosed by all of them; (4) that there is at least one event. To ensure infinite divisibility, we require also that every event should enclose events other than itself. Assuming these characteristics, temporal enclosure is an infinitely divisible point-producer. We can now form an ‘enclosure-series’ of events by choosing a group of events such that of any two there is one which encloses the other; this will be a ‘punctual enclosure-series’ if, given any other enclosure-series such that

¹ This assumption entails the consequence that if one event covers the whole of a stretch of time immediately preceding another event, then it must have at least one instant in common with the other event, i.e. it is impossible for one event to cease just before another begins. “I do not know”, says Russell, “whether this should be regarded as inadmissible.” For a mathematico-logical treatment of the above topics, cf. N. Wiener, “A Contribution to the Theory of Relative Position”, *Proc. Camb. Phil. Soc.*, XVII, 5, pp. 441–9. (Russell, *Our Knowledge of the External World*, 2nd Ed., 1922, p. 120.)

every member of our first series encloses some member of our second, then every member of our second series encloses some member of our first. Then an 'instant' is the class of all events which enclose members of a given punctual enclosure-series."¹

Events are either successive or simultaneous. The events are not simply given and the time-order added by our subjective activity, the time-order is given with the events. We cannot give absolute, but only relative, dates to events, i.e. determine their temporal position by other events.² Time always appears to be infinite in extent, for "if in imagination we travel backwards or forwards in Time, it is difficult to believe that we shall ever reach either a first event or last event, with not even empty time beyond it. Again, however little time may elapse between two moments, it seems evident that there will be other moments between them. Thus again Time appears to be infinitely divisible".

Nevertheless, metaphysicians have advanced arguments tending to show that there can be no infinite collections of things (or events) and that, therefore, the instants of time must be finite in number. Here then we have a contradiction between the apparent nature of Time and the supposed impossibility of infinite collections. This contradiction was pointed out by Kant, and since his time many metaphysicians have accepted his view that Space and Time are merely subjective. "Now, however", says Russell, "owing to the labours of mathematicians, notably Georg Cantor,³ it has appeared that the (belief in) impossibility of infinite collections was a mistake." "They are not in fact self contradictory, but only contradictory of certain rather obstinate mental prejudices. Hence the reasons for regarding Space and Time as unreal have become inoperative, and one of the great sources of metaphysical constructions is dried up."⁴

Leibnitz considered that there were no infinite numbers. Although he believed in infinite collections he considered that these, being infinite, had no numbers. Russell, of course, disagrees with this and cites Cantor, Frege, and the modern

¹ Russell, *Our Knowledge of the External World* (2nd Ed., 1922), p. 121.

² "Is Position in Space and Time Relative or Absolute?" *Mind*, July 1901.

³ Cantor published his work in 1882. See Russell's *Our Knowledge of the External World*. In another place he adds Dedekind and Weierstrass (*Mysticism and Logic*).

⁴ *Problems of Philosophy*, p. 229.

mathematical doctrines of Infinity in his support. Frege definitely considered that numbers are not applicable to physical things. They have a logical reality which is neither physical nor mental. In 1884 this writer, in his *Groundwork of Arithmetic*, showed how, mathematically and logically, infinite classes can be amenable to number in spite of being incapable of enumeration. A number for Frege is a class, e.g. the number two is the class of all couples. This view Russell independently arrived at eighteen years later. Cantor's *Theory of Infinite Numbers* was published in 1882-3. It is important to note that Frege, in defining number, asserts that no number applies to physical reality.

Renouvier, the great champion of neo-criticism, was a stalwart opponent of any attempt to solve concrete problems by mathematics, and he had something of Boutroux's scepticism of the applicability of mathematics to reality. Renouvier claimed that an infinite number was a fundamental contradiction, for it is of the essence of an infinite collection not to be numbered. There can be no such thing, he considered, as an infinite number. Its conception was for him *mathematization à outrance*, which, however legitimate on purely mathematical axioms or principles, could not apply to the concrete world.

For Vaihinger, too, the concept of infinity is a pure fiction of mathematics, which owes its origin to imagination and possesses no objective value whatever. He cites, in his *Philosophy of "As If"*, the work of Hume, Kant, Schopenhauer, and Herbart as supporting this view, and endeavours in his own treatment (which he styled Critical Positivism) to show the utility of these fictions. In dealing with infinity he says: "That the infinite itself is a fiction, whether as infinitesimal or as the infinitely great, is demonstrated especially by the startling contradictions that follow from it, as well as from the illusory problems which it engenders (cf. the Eleatic sophisms, which arise from the fact that the infinitely small is treated as an hypothesis instead of as a fiction). The idea of infinity proves to be an auxiliary introduced by thought to facilitate its operations; and just because of its immanent contradiction it makes successful thinking possible. This is the case, for instance, in mathematics, where the symbol ∞ , for 'infinity'

is simply a fiction by whose means mathematical thinking more readily attains its purpose."¹

Hence instructive light is shed upon the philosophical idea of the infinite. It, too, is an auxiliary idea of which an injurious misuse has frequently been made but which has, nevertheless, rendered certain services to thought. "This important construct", continues Vaihinger, "owes its origin entirely to the imaginative faculty and possesses no objective value whatever. The very contradictions which it contains show that it is purely fictional, and that its application to the real world is a misuse. The strongest proof of the subjectivity of space and time lies in their being infinite, and the ordinary concepts of space and time are thus unmasked as fictional, as mere auxiliary ideas, helpful pictures, developed by the logical function to bring order into reality and to understand it. It is precisely the subjective operations which admit of the abuses to which these concepts have been subjected; only a subjective operation can be constantly thought of as if it were without end and were yet complete. All these products are, therefore, pure forms of thought, purely subjective operations. It would, indeed, be strange if these concepts or ideas were actually pictures of objective reality."²

Russell, however, makes much of this development of the infinite in mathematics and mathematical philosophy, and maintains that it explains away the difficulties felt about the infinite extent and infinite divisibility of Time.

The antinomy of Kant still remains and it seems equally possible to prove that Time has no beginning or end, and on the other hand that it had a beginning and will end. Events are concrete, and this fact points to Time having had a beginning and possibly it might have an end. A beginning, a first event, would not be a beginning *in* Time, for there could be no Time before a first event, but such an event would be a beginning *of* Time. There is not great difficulty in imagining a first event, the difficulty lies in imagining a *vera causa sui*, a first cause. The problem of a beginning lies in causality not in temporality.

On the other hand, to think of an infinite succession of events in the past is to think of an endless series as having

¹ Vaihinger, *The Philosophy of "As If"*, p. 62.

² *Ibid.*, pp. 62-3.

been completed. A mathematical series may be infinite and yet completed, but a mathematical series is not a series of events. Kant thought there was considerable difference between past and future in this respect, the future series might be infinite, while the past was not. Bertrand Russell has objected strongly to this by saying it is senseless, and he thinks Kant was probably thinking of the infinite as the unended, and thinks it odd that Kant did not see that the future has one end in the present and is thus "ended" as is the past. We agree with Mackenzie in his criticism of Russell on this, that a past infinity is different from a future one. A man might conceivably live for ever, but we should hardly believe he *had* lived for ever.¹

The absurdity is well brought out by Mackenzie in his citing Russell's opinion of Tristram Shandy. This gentleman, engaging in autobiography, took two years to write the account of the first two days of his life, and lamented that material would thus accumulate faster than he could deal with it, so that he could never come to an end. "Now I maintain", says Russell, "that if he had lived for ever and not wearied of his task then, even if his life had continued as eventfully as it began, no part of his *biography* would have remained unwritten." But Shandy was writing his own biography, it was not being written for him by another, it was his own writing, and this was part of his own life. Russell reduces it to absurdity by supposing he could ever catch up. He most emphatically could not. If Mr. Russell were himself to begin to write his own interesting autobiography on these terms he would find the handicap would get worse, and the discrepancy between life lived and amount written-up would certainly become infinite and so insupportable that he would abandon the project for another volume on mathematical philosophy.

A truer image of the world, suggests Russell, is obtained by picturing things as entering into the stream of time from an eternal world outside, than by a view which regards Time as the devouring tyrant of all that is. Both in thought and in feeling, to realize the unimportance of time is the gate of

¹ Cf. Poincaré, "Mathematics are sometimes a nuisance and even a danger when they induce us to affirm more than we know." Russell, *Our Knowledge of the External World*, pp. 179-80; Mackenzie, *Elements of Constructive Philosophy*, p. 413.

wisdom. But unimportance, as he points out, is not unreality. Metaphysics, for Russell, deals with the possible, and mathematics, logic, and metaphysics, save for minor differences, tend to be identified. For Alexander, however, mathematics in its generalized concepts may get away from the reality of experience, but metaphysics is for him the science of the actual world even if only of its *a priori* characters.

Russell distinguishes physical time and mental time as did Locke. Physical time is that in which we are concerned with the relation of objective events, while in mental or subjective time we have a relationship of subject and object. He does not say, although he well might, that mental time may be purely an inner sense of succession of mental images, either by the operations of memory or imagination. He recognizes, however, that in mental time sense and memory are concerned, while in physical time the problems of the objective determination of simultaneity and succession are paramount. The distinction also implies that physical time is based on the objective before-and-after relation, while mental time involves, in addition, the characteristics of past, present, and future. But we should remember that while past, present, and future are relations involving an observer, they may be extended and used of physical time in the sense of relation to an actual happening which must be the objective present, whether it be presented to an observer or not. Consequently we must distinguish, not only *the* present from *our* present (which the operations of perception make specious), but also *the* past from *our* past, which depends on subjective power of recollection by memory or by historical record, neither of which is equivalent to *the* past. Russell rightly claims that a knowledge of the past is not necessary or essential to our knowledge of time, and he points out that much of our knowledge of the past we increase by description, but, of course, not by what he calls "knowledge of acquaintance".¹

So far as the knowledge of time goes it is knowledge of our past which matters most, and this is based on memory, and involves more than that impersonal relation of earlier and later. He defines "past" as that which is *before* the whole of the present, and "future" as what is *later* than the whole of

¹ The distinction is given in his little book, *The Problems of Philosophy*.

the present. The future is thus, we may say, the "unhappened". He considers that an event may be earlier than part of the present and yet be itself present in cases where there is succession within the present. This touches on the nature of the specious present of perception, an issue which we shall raise in our next chapter, as it lies at the basis of the discussion of physical and mental time. Subjectively, succession may be observed in the present, but objectively, succession as continuous excludes the possibility of a specious present.

Russell brings out the distinction of past, present, and future by justly claiming that we have no experience of anything as future in the way in which sensation experiences a thing as present and in which memory can experience it as past. He defines an instant as "a class of entities of which any two are simultaneous with each other and not all simultaneous with any entity outside the class". He does not, however, consider the present to be an "instant", but it is not clear which present he means. If he means the specious present of perception, certainly this is never a bare instant but always an extent, quantity or duration of time, but if he means the objective present he is wrong, because of the objective conditions necessitated by the continuous change of the universe. Two specious presents may, as he says, overlap, but, objectively, there cannot be two presents. His remark about memory and the past is a truer one. He lodges a reminder that while we relate the past and memory naturally because it is only in and by memory that we revive its image in the present, nevertheless memory does not enter strictly into the definition of the past. The past is past, whether it be remembered or not; its pastness is quite independent of the possibility of its being revived in the present by a memory image.¹ A forgotten past is no less a past time than a remembered one. There is no temporal difference, although there may be a great practical one, for in the latter case the past may be revived in the present and serve the present, but in the former case it is isolated and prevented from penetrating the present, or serving it. Russell claims that the explanation of past, present, and future lies simply in the change of our cognitive relations

¹ This is a point on which Bergson's views seem confused, as we have remarked above. He blends *the* past and *our* past as remembered.

to events. This is, however, inadequate and leaves unexplained that fundamental becoming which results in the change of our cognitive relations, a fact that can only be explained, as Broad explains it, by reference to the continuous creative advance of the universe producing new events.

With reference to the new physics and the doctrines of Einstein, Russell claims that although the principle of relativity has given prominence to the conception of local time and has somewhat diminished man's confidence in the one ever-flowing stream of Time, nevertheless the Theory of Relativity does not obliterate the distinction of Time and Space, and he asserts his opinion that it "does not destroy the possibility of correlating different local times and does not, therefore, have such far-reaching philosophical consequences as is supposed. The one all-embracing time still underlies all that physics has to say about motion."¹

The chief value of Russell's discussion lies in his insistence on the fact that Time is something different from our awareness of it.² He here insists, in a spirit of healthy realism, on the objective character of Time, while Kant, Bergson, and the Idealist philosophers leave Time as merely subjective, thus confusing (especially Bergson) Time and the awareness of time. Russell, however much he is enamoured with the mathematics of compact series and sums to infinity, does rescue us from the danger of this subjectivist and idealist confusion of Time and the awareness of time.

Russell's defence of Absolute Time is based on the view that since events form a many-one series, many events being co-present at a single moment, then there must be an objective and independent order through correlation with which the events derive their correlation. Such an independent order would be Absolute Time. Co-presence, it is asserted, is always co-presence at a given time; the inter-correlation of events takes places only because of and by means of their prior correlation with Absolute Time. Events, it is claimed, are inter-correlated with reference to time; and it is not true

¹ Russell, *Our Knowledge of the External World*, p. 239 (2nd Ed., 1922). He now appears to reject this view (*Outline of Philosophy*, 1927).

² This remains true in spite of his regrettable assertion that past, present, and future arise merely because of a change in our cognitive relations to events.

that time itself arises from the inter-correlation of the events themselves.

This attempt, however, to revive the fiction of Absolute Time must be rejected. It is a false argument intended to give an absolute position to the event independently of other events. But the co-presence of events is not determined by their relation to a moment of time which has existence apart from the events. We can only speak of events being at the same moment if we define a moment as a class of events which stand to one another in the relation of co-presence. Events are co-present not because they occupy the same moment or entity of time independent of themselves, but simply because they happen together. They correlate themselves because they co-exist, and they have no need of an entity "moment of absolute time" to do this, but rather because they happen, we speak of a moment, and this moment is not a temporal entity existent in its own right, it is simply the class of co-existent events themselves. We derive time from the events, not *vice versa*. The correlation of events takes place *inter se*, and not, as Russell argues, by the medium of an external or Absolute Time. He has, we think, been forced into maintaining this view owing to his keen desire to insist on the objectivity of the series of events and in order to oppose, very properly, views of time which are purely subjective. There is an objectivity in the series of events, but this arises not from any relation of events to Absolute Time but from the fact that they happen independently of us.¹

Russell is a firm believer in the reality of objective Time, and opposes his realism to the idealistic arguments which urge that Time is unreal. But there is a particularly interesting reflection on this point in *Our Knowledge of the External World* which is of special interest as coming from a realist like Russell, and it expresses a view entirely opposed to that of Alexander, although in general Alexander stands much nearer to idealism than does Russell. "The contention", writes Russell, "that time is unreal and that the world of sense is illusory, must, I think, be regarded as based on fallacious reasoning. Nevertheless, there is some sense, easier to feel than to state, in which

¹ In his later work Russell appears to have rejected altogether Absolute Time. He declares there is no one cosmic time (*Outline of Philosophy*, p. 164, already noted in our previous chapter, p. 199).

time is an unimportant and superficial characteristic of reality. Past and future must be acknowledged to be as real as the present, and a certain emancipation from slavery to time is essential to philosophical thought. The importance of time is rather practical than theoretical, rather in relation to our desires than in relation to truth. . . . Both in thought and in feeling, to realize the unimportance of time is the gate of wisdom."¹

This remark by a Realist may be borne in mind as a confession which serves usefully as a transition to the standpoint of Idealism, which, in the hands of Bradley and McTaggart, has sought to make time contradictory, illusory, and unreal. We shall come to an examination of their views presently. Meanwhile we may note that the treatment of Time in Alexander, Whitehead, Broad, and Russell is in definite opposition to the subjectivist view of Bergson. For them Time is an objective reality which cannot under any circumstances be regarded as or confused with our awareness of it in terms of *durée* or any other form of "inner sense".

III

Before passing to the Idealists we may note, however, the views of some other Realists and examine also the curious doctrines of some Pragmatists who (especially Boodin) hover in an uncertain manner between the realist and idealist position. Pragmatism has affinities with pluralism and, in the doctrines of James and Ward, the idealistic views of Time are again approached, although in a manner which, unlike that of Bradley and McTaggart, affirms the reality of Time and raises the issue of the relation of the temporal and the eternal.

Russell, in spite of the confession about a sense in which Time is unimportant, maintained in general the realist belief in the reality of Time with emphasis on its objective character.

¹ Russell, *Our Knowledge of the External World*, pp. 166-7. From this opinion Alexander emphatically dissents. "I should say that the importance of any particular time is rather practical than theoretical and to realize the importance of Time as such is the gate of wisdom", *Space, Time, and Deity*, Vol. I, footnote, p. 36.

Similar views are expressed by Laird, who rightly stressed the importance of recognizing an objective sense of the terms past, present, and future, refusing to look on Time as a mere change of our cognitive relation to events and asserting that present time means the events objectively happening.

The attitude of the New Realists to Time is well shown by the opinions of Spaulding, Montague, and Perry. The first writer's treatment recalls Russell's arguments about Absolute Time, which we have already criticized and rejected. To assert objectivity is one thing, but to assert Absolute Time is another, and is, as we have said, quite illegitimate. The position of the New Realists, as stated by Spaulding, shows that for them Time is real apart from things in Time. In defending the New Realist principles of analysis, this writer remarks (in the volume of American Essays collected under the title *The New Realism*) that "analysis shows time to be a series, its terms to be instants, its relating relations to be asymmetrical and transitive. It is absolute and not relative. It subsists whether anything exists in it or not, and whether it is known or not. This is the realistic view of time."¹

It is a view which stands in, and is definitely placed in, a relation of opposition to the views expressed by Bergson in his notion of *durée*. The Bergsonian view of Time is, for the realist, fundamentally false because of its subjectivity and its refusal to accept a time which is not *perçu* and *vécu*. For the New Realist, Time is independent and it is related to instants rather than to events. This makes Time an absolute in its own right. It involves an asymmetrical relation and transitivity.² Time for the New Realist is a continuous manifold of instants, but Spaulding admits that instant is, perhaps, indefinable.³

Montague, one of the least dogmatic of the New Realists, attacks serial time. He regards time as a relation between events. Most relationists deny that time can be divided into instants with no duration. Montague objects to this depreciatory view of instants, but he demands a thread to hold them together, and announces a theory to combine the relational and puncti-

¹ *The New Realism*, p. 223.

² A relation is asymmetrical if it be irreversible, so that we have A—B—C but not C—B—A. It is transitive if the relations A—B and B—C are such that they imply A—C.

³ *The New Realism*, p. 190.

form views,¹ which includes the merits of both—the Double Aspect Theory. We must have the points and the relations, too. Without the points the line could not exist, without the relations of the points no line could appear. So with time. Instants must be before and after each other, but relations of succession are as truly elements of time as the instants themselves.²

This is shown very strikingly in Professor Montague's answer to the question: "If a body at each instant of the time of its motion is in one and only one position in space, when can it move from one position to another?" To this he replies: "The body can move from one position to another when one instant succeeds to another."³ Observe that it is the *relation of succession* which is supposed to have effected this. To the obvious objection, that "when" is itself an affair of instants, Professor Montague replies that "the time when one instant succeeds to another is a perfectly real time, though it is not itself any instant, just as the 'space where' one point is beside another is a perfectly real space, though it is not itself any point".⁴ This problem is as old as Zeno, and in this connection Perry's discussion is of both interest and value. He rightly points out that if it is held that Achilles never can overtake the tortoise because he can cut down the tortoise's head only by an infinite, i.e. endless series of diminishing gaps, this only means that the operation of overtaking is a *continuous* process. If it be objected that Achilles must successively pass through an infinite number of points we must remember that he has an infinitely divisible time in which to do it.

Perry brings forward some pointed criticisms of the view of Time adopted by Bergson.⁵ He is rightly amazed at Bergson's cavalier treatment of objective time.⁶ The insistence by Bergson on the qualitative aspect of time does nothing to disprove its quantitative aspect. Intensive magnitude and *la durée* are all very well, but they are no substitute for the extensive magnitude represented by the symbol *t*. Certainly it does not follow that measured time is merely space, or that a number of time units do not in themselves possess an extension

¹ This refers to Russell's compact series.

² Montague, *The Antinomy and its Implications for Logical Theory*, p. 245.

³ *Ibid.*, p. 247.

⁴ *Ibid.*

⁵ Perry, in his *Present Philosophical Tendencies*, p. 250.

⁶ *Ibid.*, pp. 255-60.

which is neither a mere mathematical fiction nor a ghost of space. It is an extent of time, but Bergson, as we have already pointed out, rejects objective time. Perry endeavours to show that in his insistence that such units of time because they are orderly are merely an order, Bergson really falls into the vice of that very intellectualism which he professes to be engaged in overthrowing.

Bergson's objection to objective time and to equations about time rests upon an erroneous view and on a confusion of symbols with their meaning. The equation $v = gt$ means something about a temporal process. This, however, he will not admit. But if time can be halved or doubled as he suggests, it must have an extensive magnitude. Further, what other meaning could we give to the phrase "a few seconds"? If we reject extensive magnitude no quantitative determination of time can ever be made, but it is nevertheless true that all experience of time is experience of an extended amount of time.

Perry, in addition to his highly proper and relevant criticisms of Zeno and Bergson, has some interesting comments to make on the attitude of the Pragmatists to the Time-problem.

In the first place, pragmatism, like naturalism, and all empirical philosophies, maintains that time is a fundamental property of existence. Thus pragmatism is opposed to all theories which claim to deduce time from something else; for example, from the nescience and relativity of the human mind. According to such a view, the temporal aspect of things is due to the modification of finite subjectivity. To reach truth means to escape this limitation and see things *sub specie aeternitatis*. Thus, according to the view held by Parmenides, Plato, Spinoza, and others, Time is unreal in the sense that it is one of the appearance-characters which reflective knowledge eliminates. Or Time may be deduced from some higher logical or ethical category, as is attempted by some modern idealists. In this case Time is real, but only so far as it is a manifestation of some higher principle. Sequence is incidental to the dialectic of thought or to moral progress.

Pragmatism, on the other hand, insists upon the original and irreducible character of Time, as well as upon its peculiarly important part in existence. Time is more, and not less, original than dialectic and progress, since the latter contain

the specific characters of sequence and change, and add further characters to them. Existence is the manifold that is *in* Time, whether it exhibits these other characters or not. So that instead of saying that existence is a dialectical or ethical unity, embracing temporality, one must say that existence is the series of temporal events, with whatever of dialectical or ethical unity may happen also to be added. This, then, is the first issue; and the position of pragmatism is entirely unambiguous.¹

Perry rightly points out that the pragmatists' assertion of the temporality of existence is entirely irrelevant to the question of its determination. A temporal existence may be a bare sequence of disjointed events or a lawless flux of interpenetrating phases; or it may be an order which obeys a law. Which of these it is must be judged by other evidence than its mere temporality. This is very sound, for belief in time does not commit us to any particular doctrine of determinism or of freedom. That is another problem involving issues irrelevant to our investigation of the nature of Time.

Pragmatism and pluralism, however, have strange bed-fellows, and this is apparent when we turn to such writers as Dewey and Boodin.

Dewey's attitude to Time is curious in that he denies our knowledge of the past. Lovejoy, one of the Critical Realists, commenting on this, rightly urges "the absurdity of denying the name 'knowledge' to detached and impartial study of the past, while permitting anticipation to claim the title knowledge".² We agree with Dewey that, from the standpoint of life and immediate action, perception (as Bergson has also put it) is more important than memory. Anticipation may be "more primary than recollection, projection than summoning of the past, the prospective than the retrospective",³ but that does not warrant the statement that "to isolate the past, dwelling upon it for its own sake and giving it the 'eulogistic'

¹ Perry, *Present Philosophical Tendencies*, pp. 250-1.

² *Essays in Critical Realism*, p. 64; and in "Professor Dewey's *Tertium Quid*" (Time, Meaning, and Transcendence), *Journal of Philosophy*, 1922.

³ Dewey, *Creative Intelligence*, p. 13.

name of knowledge, is to substitute the reminiscence of old age for effective intelligence".¹ It is objectionable to apply the term knowledge to the future. Anticipation of the future is not knowledge, and even if it were foreseeable by man or Deity, awareness of it could not be the same as awareness of the happenings we call past and present. The pragmatic position, as maintained by Dewey, which makes all objects of judgment future is untenable, and as absurd as a discussion of "the futurity of yesterday".² Dewey appears to be seeing the time-series upside down and to fail in appreciation of that elementary difference in the use of words and ideas contained in "yesterday" and "to-morrow". Yesterday we know, and we know it as past and gone, its context determined. We may anticipate, imagine to-morrow, but we do not know it as we know the present. It may be added, although further insistence on this point is hardly necessary, that we can only anticipate to-morrow because of the existence and passage into the past of yesterday. Also, in fact, our plans for to-morrow will be found to be based largely on our experience of yesterday and all other yesterdays.³

Alexander, in referring to Laplace's "calculator", claims that ignorance of the future is not merely due to defects in our knowledge of the past and present. He claims that, while spatio-temporal calculations or predictions of the future can be made, no prediction of new qualities can be made from the plane of the present.

But even if we were to assume that complete knowledge of the future is possible for one perfectly acquainted with past and present, or if we assume a Deity who knows what is to us the future, there would still be a difference in the cognitive relation to events occurred and events which, even if known by prediction, have not yet *happened*.⁴

¹ Dewey, *Creative Intelligence*, p. 14.

² Id., *Influence of Darwin on Philosophy and other Essays in Contemporary Thought*, p. 161.

³ See the article by Lovejoy on "The Alleged Futurity of Yesterday" (Time, Meaning, and Transcendence), *Journal of Philosophy*, 1922; and more particularly Lovejoy's discussion of "Pragmatism and Knowledge of the Past" in his chapter "Pragmatism versus the Pragmatist", in *Essays in Critical Realism*, pp. 63-73.

⁴ This would remain true even if Dunne made good his claims to experimental prophecy by dreams, and it must be remembered that he does not claim his book, *An Experiment with Time*, to be scientific evidence.

Boodin, a pragmatist with cosmic interests and a new statement of evolution, has a view of Time quite peculiar, even for a pragmatist.¹

He proceeds directly to his task by asking: "What sort of concept is time? To follow a somewhat antiquated terminology: Is time a formal or material concept? Or to be more modern, perhaps, is time a purely ideal construction or must it be considered also as a character of reality?" He attacks the Kantian doctrine of time as crude and unwarrantably censures Kant for his neglect of the genetic problem, forgetting that Kant was concerned with the significance of time, not with the psychological question of how the notion of time grows up in us. This, as in the case of Spencer, is a misunderstanding of the spirit of Kant's work which was concerned with the *a priori* in the sense of the logical *a priori* not the psychological *a priori*. The quotation of Schopenhauer's jest about Jacobi, to the effect that "he took everything for *a priori* which he had learned before he was twelve years old", is here quite beside the point. Boodin affirms that time is, of course, *a priori* like every other conception. One wonders whether he would say that the conception of God is *a priori*. He quite misses the reasons Kant gave for urging that time was *a priori*. This, of course, only bears out the truth of a wise saying of Schopenhauer: "Let no one tell you what is in the *Critique of Pure Reason*." Persons who casually profess to tell us what Kant said almost invariably misrepresent him because they themselves have misunderstood him. Professor Boodin is one of these persons. He considers that Wundt was right in pointing out that time must depend upon experience for its character, and that he entirely failed to show what this character must be. In attempting to find a correspondence between the *a priori* form and empirical succession he has only shown the utter untenability and absurdity of the Kantian position. Now we have shown wherein Kant's view of time may be legitimately criticized, but it is not on the lines which Boodin puts forward. We may well be suspicious of a writer who treats Kant in this way,

¹ Boodin is the author of several volumes. His work, *Time and Reality*, was issued by the *Psychological Review* (U.S.A.) as a monograph supplement in 1904. October, Whole No. 26 (Vol. VI, No. 3). His other books are *Truth and Reality*, *A Realistic Universe*, and *Cosmic Evolution*.

and we can only be confirmed in our estimate by the surprising discovery in the first pages of his monograph that he cites Shadworth Hodgson, that verbose and unsatisfactory writer, as a deep and acute thinker! We shall, indeed, do well to nerve ourselves for meeting here at any turn of the page the unexpected, the *bizarre*, and the perverse.

Boodin rejects the view that Time is a qualitative series. Equally he rejects the suggestion of Teichmüller that it is a perspective for it is rather Time which gives perspective, but it is not itself mere perspective. Even the "deep and acute thinker", Hodgson, he takes to task for having called time the "duration of process", affirming that time is rather "the fleetingness of process" than the duration of process, overlooking the fact that all temporal duration must necessarily, because it is temporal, be fleeting.¹ Time is at once both duration and succession. Boodin affirms that the qualitative view of time fails to give us a *continuum* of experience. More fundamentally he claims that any series, involving as it does qualitative difference and order, is merely an ideal construction. No series is or can be given, it is purely subjective. The series *par excellence* is history. It is "the registration of the time-process as such and all series get their data from it. As the registering series it has a peculiarly factual character and is objective to our conceptual processes which must accept it as a datum". But this series, we are told, is prior to reflection and it points to a *negative* character in the world. Since, however, it is a series it points to a relatively constant character in the world, namely habit. From this "habit-taking time-process" the eternal is derived. Series has a character, we are informed, essentially antagonistic or contradictory to time. Series has the character, taken in abstractness, of *simul* or timelessness.

Truly we have alighted on a doctrine that may well be described as *bizarre*. It is difficult to know where to begin criticism on this, so we shall persevere meantime with the examination of Boodin's view of Time as an Ideal Quantitative Construction. We are here informed that all previously said about series holds of quantitative series. If Time were merely quantitative it is claimed that it would be Space, a saying

¹ Such a view, as we have already pointed out, makes Time merely the present which is quite inadequate.

which might be expected to throw us into the arms of *la durée réelle*, had not Boodin, in his previous section, already exorcized the qualitative spirit. Time is not quantitative, for this would be to falsify it. "Time", we are informed in an uncanny fashion, "*creeps into* our world of description and negates it."

This weird sequence of statements is summed up in a conclusion or set of conclusions, said to have been arrived at. Certainly they have been arrived at by questionable routes, and much smuggling and juggling has marked the journey. "First, time cannot be stated as a series or order concept, because the series and order concepts already presuppose time in their genesis, and once constituted involve the co-existence of the terms within the timeless meaning of the subject. In the second place, time is not reducible to terms of pure quantity, for quantity, both as regards its continuity and the constituting of its units, presupposes motion, and motion can only be defined in terms of time. In general our result so far is that time cannot be defined as an ideal construction merely, whether qualitative or quantitative, but is somehow involved in the nature of the real subject-object as a property or substance of the real world."¹

Time is then examined as a material concept, and Bergson's view of Time as real is quoted (unfortunately at second hand). It is somewhat strangely claimed that this doctrine makes motion and continuity impossible. With cavalier rejections the philosopher who has done so much to emphasize the continuity of Time and of change is dismissed in a superficial manner by the perverse use of arguments against him which he himself opposes. There follows an outburst against moments which has some slight justification although perhaps it is hardly relevant here, and then Boodin begins to make his own view a little more definite and shows himself to be suffering from an obsession about "series". "We cannot", he says, "conceive of time as serial without making both truth and reality impossible." The reasons for this are that if we make time serial in character we are faced with a dilemma:

"1. If you assume your time-series to be real, then you have the co-existence of an indefinite number of real, exclusive moments claiming the same space, for each moment of time

¹ Boodin, *Time and Reality*, p. 24.

claims the whole of concrete perception with its dimensions. But reality cannot be both one and many in the same respect, hence reality becomes impossible.

"2. But if the time-series is regarded as ideal, then we have an indefinite number of descriptions or judgments, each exclusive of the other and each referring to the same reality at the same point. Hence our descriptions or judgments claiming to be diverse and yet of one reality, in the same respect, are contradictory, and truth becomes impossible."

"The only possible solution", continues Boodin, "as we have already indicated, is to regard time as non-serial or prior to series and to regard series as a derivative construction. Time must, somehow, be involved as a property or substance of the real, conditioning the whole world of subjective construction."¹

Proceeding thence to a discussion of time as a property of the real, Boodin recalls the antinomy presented by Mill in his *Examination of Sir William Hamilton's Philosophy*, in the query as to how past and future can co-exist in the present. The antinomy as set out by Boodin is no true antinomy at all, but involves the contrast of true past, present, and future with our remembrance of past events, our perceived present, and the future as anticipation. The specious present is referred to as a possible solution of this difficulty and is rejected, not on the valid grounds which we set out later, but by quite specious statements about quantity and about the ultimate nature of time as non-being. This absurd definition is emphasized by reference to the fact which Broad noted in his discussion of McTaggart, but Boodin states it in his own way. "Time is that property of the real subject-object which makes incompatible judgments (i.e. different judgments as regards the same attribute of reality at the same point) necessary." Instead of proceeding, as Broad did, to relate time to change and becoming, Boodin says this proves that time is really non-being, not relative non-being, but absolute and dynamic non-being. Reality is again defined as a habit-taking time-process, into which time as non-being creeps and falsifies our systems of truth. But if reality be a time-process in any sense, even if given to habit-taking or drug-taking or any other queer characteristic, how can time be equated with non-being?

¹ Boodin, *Time and Reality*, pp. 25-6.

There are other strange statements here which will not abide our question. Change, we are told, is only change of point of view. Past and future are purely ideal constructions. We are glad, however, amid this giddy flux of ideas to be informed that the past is not reversible in Professor Boodin's theory. This is, indeed, comforting, for his general views on Time seem to reverse all that sane thinking might hope to establish about Time. He will not allow us to say Time is an irreversible *series*, for Time is not a series, and in any case reversibility can only be predicted of process, not of series, which is static, a *simul*, a co-existence.

We are glad to be assured that time is not space. We always felt this to be so, but were afraid of what Boodin might make of it. With a pragmatist of cosmic interests one never can tell. But he informs us that the distinction of space and time lies in the fact that space is serial, but time is not. This, far more than any of Bergson's assertions, involves such a reversion of our habits of thought that we begin to think we are reading, not a serious monograph of the *Psychological Review*, but a new edition of *Alice Through the Looking-Glass*.

Boodin will not admit that events form a series or that time is a dimension. Only space, he thinks, can be dimensional.¹ Time, we are informed, is "the negative property which makes all systems unstable". If we think of it otherwise and if we dare to think of it serially, it is difficult to distinguish from number. This plea is ridiculous, for not much intelligence is required to keep number and the thing numbered distinct from each other.² Boodin's own theory of number presupposes for its genesis time and habit. The problems of infinity arise from the mischievous view of time as serial, but the conception of the infinite which is an ideal construction, presupposes time, and we are, Boodin claims, "begging the question if we talk about the infinity of time".³ Equally unsatisfactory, he holds, are the discussions of infinite divisibility. A line may be infinitely divisible as a concept, but no sum of the infinite divisions will produce a line. Rejecting the doctrines of both

¹ If Descartes's view of dimension as continuous quantity were followed, there would be no reason for denying the term *dimension* to time.

² Aquinas commented on this. See Chapter II, p. 41.

³ Boodin, *Time and Reality*, p. 42.

Aristotle and Kant about continuous quantity, Boodin claims that time is not a continuum. While he is correct in saying that points and boundaries are ideal abstractions and do not explain continuity, his remarks on motion rest on the view of time as a negative factor. "Motion supplies that element which negates the discrete positions, which makes the points spread and flow into each other; and that element in motion which gives rise to this fluency is not the qualitative, habit, or space aspect, which, on the contrary, gives us discreteness of position, but the negative or time aspect, which negates the various positional values. The continuum, therefore, presupposes time for its definition. This is true whether we consider the individual history or the Universe as a whole."¹

Attacking the problem of causality, Boodin takes to task both Kant and Schopenhauer as well as Hume. This Gordian knot he loosens in truly Alexandrine fashion. "Here", he cries, "is where the tug-of-war begins. Make uniformity or law absolute and the time element vanishes. Causality becomes lost in mechanical reciprocity or ideal system. . . . If, again, you emphasize the chance or time aspect, you make any uniformity, law or necessary connection impossible." Here we begin to see signs of what we had suspected all along. This excursion into the realm of "Time and Reality" is being made like that journey of Alice under the guidance of the Mad Hatter. We can almost hear him remarking:

"'Ah! that accounts for it,' . . . 'He won't stand beating. Now if you only kept on good terms with Time, he'd do almost anything you liked with the clock. . . . You could keep it to half-past one as long as you liked.' . . . Alice sighed wearily. 'I think you might do something better with the Time', she said, 'than waste it asking riddles with no answers.' 'If you knew Time as well as I do,' said the Hatter, 'you wouldn't talk about wasting *it*.' "²

Time for Boodin is chance, which creeps in and makes everything unstable. It is a kind of Poltergeist that takes an unholy glee in unsettling all things.

Referring to the problems of past and future, Boodin rightly affirms that the past is not a mere fiction, although it no longer

¹ Boodin, *Time and Reality*, p. 45.

² Carroll, *Alice's Adventures in Wonderland*.

exists. "The Greeks are no longer besieging Troy and Cæsar is no longer crossing the Rubicon." But he follows this by the amazing contradiction that the past has no facts of its own. What about the siege of Troy and the crossing of the Rubicon just mentioned? Surely these are facts of the past peculiarly its own, as they do not belong to the present. Then comes the more amazing declaration that the future resembles the past in *having no content*. The past and the future are thus blended in a hopeless confusion. The past, he tells us, is plastic in our hands. But the before-and-after relations within the past are unalterable. Our theories about it may be plastic, but this is another matter. The past is not merely our hazy remembrance or fanciful reconstruction of it in the present. Boodin admits it has "chronology", which must mean it has dated events; this is inconsistent with the absurd statement that the past has no content, no facts of its own.

Time is, however, essentially succession in duration, and if the element of succession be ignored or denied then time is presented in a mangled form. It is impossible to exclude succession from time, and even Boodin, try as he may, cannot do it. "Space, eternity, the *simul* system of significance, must be considered as derivative in relation to the time-process which ever looks upon itself anew under the same formal limitations." Surely a process which ever looks upon itself anew involves succession. To eliminate succession is impossible, and if it could be done would change time altogether to one static now, and obliterate the becoming of the world of events altogether. It is difficult to take such a view of time seriously. Such a doctrine could perhaps only be produced by a pragmatist who was playing with idealist views of time. Only a pragmatist could refer to time as "the negative property which makes all systems unstable".

The emphatic rejection of time as serial arises from the fact that Professor Boodin falls between the two stools of idealism and realism, and arrives at a view which no idealist or realist could hold and one which is decidedly perverse. While, for example, Alexander considers that space gives continuity to time on the doubtful ground that it is not in itself continuous, Boodin considers that it is the function of time to give (through motion) a continuity to space. "Without the negation, or

passing of time, space would fall asunder into discrete positions. . . . Time is bound up with the fluent or continuity aspect of our world. Whereas space is bound up with the diversity or habit aspect, the serial aspect." Hence he views space as a system of co-existent series, whereas time is non-serial. Further, it appears that the series which is space is non-successive, but static and co-existent. How, then, can it be a series, and how can a non-serial time give rise to spatial series?

To take another point. It is true that positions, points, and instants are secondary abstractions from continuous process, and it is equally true that our experience of time is an experience of an ever-vanishing content of continuous process. But this is very different from stating, as Boodin does, that "Time is a species of the genus non-being". How can the genus non-being possess any species? There can be no qualitative distinctions within non-being to give rise to any species. Apart from this inconsistency it cannot be maintained that time is non-being. That could only be the case if all events were given in a *totum simul*, which they are not, hence time arises as a form of Being, and although allied to that form, which is *Becoming*, it cannot be equated with non-being.

A similar morass of difficulty is encountered gaily enough by this writer in further discussions about time, causality, and chance. He does not agree with Kant in believing that some time-sequences are not causal. Cause and effect cannot be the same or nothing would ever happen. We should have merely one fact and no process, no world of events. On the other hand cause and effect, he argues, cannot be different because they would then be two facts and causality would be outside them. "Time", he claims, "is that element in reality which makes all our descriptions relative, and that is precisely what we mean in the last analysis by chance."¹ The notion of chance is entirely opposed to causality. Boodin accepts this opposition and declares that time and true causality are incompatible. Make uniformity or law absolute and the time element vanishes. If you emphasize chance or time, then

¹ Time, he adds, "conditions the arising of spatial series and is involved in the *ratio fiendi* of space, but on the other hand space as a system of relations conditions the knowing of time and is the *ratio cognoscendi* of time". Boodin, *Time and Reality*, p. 54.

causality is impossible. This separation of time and causality and this identification of time with chance is quite unwarranted, and leads to amazing inconsistencies. Boodin admits that causality marks the struggle of the self to synthesize or unify the process of experience. But his view of time is a denial of real process altogether, and there can be no unity if, as he claims, time is the element of instability, the factor which disintegrates all sequences. Finally, cause itself is reduced to a form which is timeless, on the ridiculous ground that the elimination of the element of chance involves the elimination of time. In this perverted doctrine time, and chance, and freedom are all alike. "Wherever there is real process, where events happen, there", it is argued, "we have chance". Time and chance used in this ultimate sense are identical.

The statements about time, number, and history are ridiculous. "Time", we are told, "creeps into history only in so far as chance shows itself." Naturally we thought all history involved time or it could not be history at all. The reference to chance is beside the point, and the equation of chance and time reduces most arguments about time to absurdity.

Some clue is offered to this amazing series of statements (we cannot call them arguments) by a remark asserting that "real process lies outside the field of scientific description". This might forecast the development of a Bergsonian view of time, but it does not, qualitative time being already condemned, and it seems, indeed, idle to forecast what pragmatism in the hands of a writer like Boodin will say of time. It is evidently capable of saying anything.

We must note, however, that the entire pragmatist position is not exactly that of Boodin. We have been told that "Pragmatism is an Idealism in the making".¹ This aspect of it is clearer in writers other than Boodin.

James, it will be remembered, remarked that "for pluralists Time remains as real as anything, and nothing in the universe is great or static or eternal enough not to have some history".² He criticized the timeless or block universe conceived by some idealists. In this connection he commented on Royce's treatment of Time and Eternity (to which we shall turn in our

¹ W. R. Boyce Gibson, *God With Us*, p. 189 and Chap. X.

² James, *A Pluralistic Universe*, p. 44.

next section), that were there no longing in Time there would be no peace in Eternity. James objected to the Eternal being set in entire opposition to Time. Against those who affirmed that Time could not really matter in philosophy he affirmed that "no philosophy can ignore the temporal quality of experience". It is views of this kind which appear to justify the expression that "Pragmatism is an Idealism in the making".

A somewhat similar view about Eternity and Time was put forward by the English pluralist, Ward, who had affinities with Bergson on the psychological side and also with James. Some special points connected with Ward's psychological analysis we reserve for critical comment in our last chapter, but we may note here that in his Gifford Lectures on *The Realm of Ends* he appended a discussion of the problem of Time and Eternity, which may usefully be compared with the views of James on the one hand and those of Royce on the other.

Ward considers that we must accept the reality of change and of time, but the experients of that change and time are not entirely involved in the flux they experience, although they are functionally related to it. In this lies the germ of the conception developed by Von Hügel of "Eternal Life", in which, while the quantitative flow of time remains as such unaffected, its *qualitative* significance is changed. The mediaeval views, Ward points out, suffered from a static conception of the Eternal which failed to reconcile the idea of perfection with that of life, as lamentably as did Aristotle's *νόησις νόησεως*. Perfection, he considers, does not eliminate the possibility of change. To eliminate change is to eliminate life. There is, he asserts, progress in perfection as well as towards it. If we do not recognize this then the problem of relating, for man, progress and perfection remains as insoluble as relating, for God, perfection, and life.¹

Idealist although he is, Ward is not a monist, but a pluralist, and he finds considerable difficulties in the view of Time and Eternity expressed in the Hegelian philosophy. He examines

¹ Ward claims that "unless God has pre-ordained all that is to be done, it is surely a contradiction to say even of him that he has such a knowledge of the future as we have of the past". We claim that even if God has pre-ordained all, he will still distinguish what is past and future for us.

three possible meanings of the term Eternal or three senses in which Time and Eternity are contrasted, the formal, the ontological, and the axiological, but in none of them does he find "any justification for the Hegelian view that 'God is the eternal reality of which the world is the temporal expression' unless, indeed, this is interpreted in such wise as to leave the world genuinely a realm of ends in the pluralistic sense. That, he concludes, it cannot be if the temporal is reduced from the phenomenal to the illusory (from *Erscheinung* to *Schein*, as a German would say) nor if the eternal is raised from the noumenal to the logical, cut off from living activity by apotheosis in the firmament of ideas."¹

Stress on the element of activity as real in the Universe and in Time was laid by Schiller, who claimed that Time has both a real beginning and a real end. Time itself he describes in language derived from Plato and the mediaevals. It is potentiality becoming actuality, a phrase beloved of the Schoolmen. It is, as for Plato, the corruption of Eternity, the measure of the impermanence of the imperfect.²

Similar in standpoint is the treatment of Howison, who, while stressing *pluralism*, nevertheless asserts, in his *Limits of Evolution*, that the temporal requires for its ground and explanation an eternal principle. This, however, he considers to lie not in an Eternal One, but in many Eternal Minds or in a Democracy of many creative selves. As with Leibnitz, these "monads" are self-sufficing and are really spiritual in nature and timeless in character.

Here again, as in the previous section, we are brought face to face with the Idealist position. For Kant, it will be remembered, Time was a form of the inner sense, while Bergson's *durée* was equally and more definitely subjective. Against this the realists rise in objection. Time for all of them has objective reality and Bergson is, in their eyes, rightly regarded as one who confuses Time with our awareness of it. In Alexander, Whitehead, Broad, and Russell, the main emphasis is laid on

¹ Ward, *Realm of Ends*, pp. 476-7.

² Schiller, *Humanism*, Chap. XII.

Time as the objective succession of events. But even in Russell there is an appreciation of the non-importance of Time. In James and Ward we have a concrete recognition of Time no less than in Bergson, but it is thrown on to a background which stands for the modern representation of that conception of Eternity or Permanence seen in Parmenides, Plato, Augustine, and Aquinas. Ward, for all his insistence on Time as concrete, leads us naturally to the views of Royce, Pringle-Pattison, and Von Hügel. In a phrase which binds Plato and Von Hügel to himself, Ward remarks: "Between the temporal world of ideas and the temporal world of phenomena free agents have their place."¹ The remark might have been uttered by Von Hügel, who, in his sympathies with Plato and Aquinas, carries us to a point of view beyond that of Time, although not antagonistic to Time. Even Idealism cannot explain away Time, in spite of the efforts of McTaggart (which Broad criticized). To an examination of the Idealist doctrine of Time we now turn, thus completing our discussion of the treatment of Time in contemporary metaphysics, and we shall find the opposition to the objective standpoint of the realists most trenchantly expressed in the neo-Idealism of Gentile.

IV

While the Idealists tend to minimize Time, the Neo-Idealists, as Bosanquet showed, seem to stress the temporal character of the Universe and thus bring together in the doctrine of Time the supposed extremes of realist and idealist thought.²

The British School of philosophical tradition became strongly marked by Hegelian Idealist influences, which, conveyed by Stirling, were taken up and expressed by Green, and later flowered in the philosophical work of Bradley, Bosanquet, and McTaggart, as well as in the work of Mackenzie, Royce, and Pringle-Pattison. Green was unable to make any substantially new contribution to the problem, for his conception of an Eternal Consciousness reproducing itself in the temporal process and linked up with human perfection as some far-off

¹ Ward, *Realm of Ends*, p. 306.

² Bosanquet, *The Meeting of Extremes in Contemporary Philosophy*.

divine event, to which the whole creation moves in a real time-process, leaves Kant's difficulty about the possibility of any real beginning to a time-series unsettled. Further, it is difficult to reconcile Green's assertion that the Eternal Consciousness is timeless with his treatment of its reproducing itself in Time.

It was at this point that Bradley revived the old conception of degrees of truth and degrees of reality, and strove by this means to outline for us a conception of an Absolute which is essentially eternal or timeless, as more or less adequately expressed in a process of appearance in Time.¹ This point of view is valuable, but only in so far as it can lead us on to a discrimination of values. We are left with the task of discerning the realities, experiences, and events which have abiding worth, as real, and discriminating these from the mere transient flux of appearances. Bradley attempts to show that Time is an appearance which contradicts itself and endeavours vainly to appear as an attribute of the timeless.² "If", said Bradley, "there be no supreme spiritual Power which is above chance and change, our own spiritual interests surely are not safeguarded. But with any such Power it seems to me nonsense to talk of the absolute reality of Time."³

In his *Logic*, a work published several years before his *Appearance and Reality*, Bradley graphically depicts his view of Time. "We seem to think", he remarks, "that we sit in a boat and are carried down the stream of time, and that on the bank there is a row of houses with numbers on the doors. And we get out of the boat and knock at the door of No. 19, and, re-entering the boat, then suddenly find ourselves opposite No. 20, and having there done the same we go on to No. 21. And all this while the firm, fixed row of the past and future stretches in a block behind us and before us. If it is really necessary to have some image, perhaps the following will save us from worse. Let us fancy ourselves in total darkness, hung over a stream, and looking down on it. The stream has no banks and its current is covered and filled continuously with moving things. Right under our faces is a bright illuminated spot on the water, which ceaselessly widens and narrows its

¹ Bradley, *Appearance and Reality*, Chaps. IV and XVIII.

² *Ibid.*, p. 209 (2nd ed.).

³ *Id.*, *Essays on Truth and Reality*, p. 250.

area and shows us what passes away on the current, and this spot that is light is our now, our present.”¹ This paragraph has an interest apart from its vivid imagery.² It shows Bradley’s hostility to the popular conception of set out, numbered moments, in which the quality of presentness moves along a row of events. His suggested illustration is, of course, much nearer to our experience of time.

Later, in *Appearance and Reality*, Bradley urges that whatever way we look at it Time is self-contradictory. “If we take time as a relation between units without duration then the whole time has no duration and is not time at all. But if we give duration to the whole time then at once the units themselves are found to possess it, and they thus cease to be units. Time, in fact, is ‘before’ and ‘after’ in one; and without this diversity it is not time. But these differences cannot be asserted of the unity, and on the other hand, and failing that, time is helplessly dissolved.” Further, he continues: “If we take the presented time, that involves change, a ‘now’ becoming a ‘then’. Thus if in any time we call presented there exists any lapse, that time is torn by a dilemma, and is condemned to be appearance. But if the present is timeless another destruction awaits us; Time will be the relation of the present to a future and a past, and this relation, as we have seen, is not compatible with diversity or unity.”³ In a subsequent chapter he claims that “Time is so far from enduring the test of criticism that at a touch it falls apart and proclaims itself illusory”.⁴ Yet even there he is forced to admit that although “contradictory” and therefore unreal in character, “mere appearance”, nevertheless it exists “and must somehow in some way belong to our Absolute”.⁵

Bradley argued that Time is in itself not only paradoxical but contradictory, hence he concluded it must be only appearance. We must object, however, to Bradley’s way of putting the case. Contradictoriness is a feature of propositions,

¹ Bradley, *The Principles of Logic*, Bk. I, Chap. II, Vol. I, pp. 54-5.

² It may be compared and contrasted with that given in Matthew Arnold’s poem, *The Future*. Compare J. W. Dunne’s diagrams and argument in *An Experiment with Time*, pp. 117-21.

³ Bradley, *Appearance and Reality*, Chap. IV, p. 42.

⁴ Ibid., Chap. XVIII, p. 207.

⁵ Ibid., Chap. XVIII, p. 205.

not of existences or facts. Time is a fact, and however paradoxical in character it may appear to be, however contradictory the propositions asserted *about* it may be, Time cannot itself be contradictory. It may appear incompatible with other features of reality, but these incompatibilities are largely due to our judging Time by standards which omit all temporal reference. If we set up a view of the Universe which makes the sequence of past, present, and future appear impossible, or incompatible with it, then so much the worse for the original view and initial standpoint. Anyone who proceeds thus is naturally entangled in dialectical difficulties and cannot fairly complain if he cannot see through the dust he has himself raised. For he has been guilty of making originally the false abstraction of Time from the temporal events of which alone he has experience. If Bradley, or anyone else so minded, finds the abstraction unintelligible or sees Time as then incompatible with it, so much the worse for the abstraction, and obviously the remedy lies in his own hands.

On closer examination, however, of Bradley's position, we can see that we are compelled to analyse more closely what he *can* mean by his view that Time is contradictory or incompatible with other aspects of reality. He may mean that our description of Time is paradoxical and contradicts its true nature, but this would in itself prove nothing about Time. Further, to argue as he does, that Time is inconsistent or self-contradictory again overlooks the essential feature of Time. We know that Time is what it is because succession is contained in duration. This is a fact and it cannot be argued away by logic, since we experience both as facts. To do so is to assume an *a priori* abstraction which is not in accord with our temporal experience. That experience is precisely the experience of succession *in* duration. If Bradley means that Time is inconsistent with other features of reality, it must be remembered that he does not indicate what those features are. If Time is appearance, so is our experience. But it cannot be claimed that experience is appearance, for that would contradict science and philosophy, as in both we use experience as our critical weapon in laying bare mere appearance. Time cannot, therefore, be appearance. Bradley has erected a system, abstracted from Time, by which he expects to judge and reject Time.

But the real outcome of his view is, not that Time is self-contradictory, but that his Absolute is self-contradictory, and that largely because he has neglected the facts of our temporal experience and omitted Time from his conception of the Absolute.

An outstanding giant in the discussion of the reality or unreality of Time has been the Cambridge philosopher, McTaggart, whom we may describe as an Ontological Idealist. No one has more ruthlessly and relentlessly maintained that reality is timeless than McTaggart.¹ He argues that everything in Time is past, present, or future, but, as these are incompatible predicates, the time-series is self-contradictory and unreal. He conceives the temporal process as leading up to an end which is timeless. There is a progressive realization of the timeless reality so that eventually "the last enemy to be overcome" (before we achieve Eternity) "is Time".

To this view of McTaggart the objection can be raised (as equally against some theological views of Time) that the time-process leads up to its contradictory, eternity. The time-process is, as it were, artificially "stuck on" at the front, but is denied participation in ultimate reality. Mackenzie objects that, instead of saying, with McTaggart, Eternity is in a certain sense in Time, we should say that Time is in a certain sense in Eternity.² Reyburn, in an article on "Idealism and the Reality of Time", has well argued, in criticism of McTaggart, that his arguments cannot be accepted as implying that Idealism must deem Time to be unreal.³ The facts of change and time cannot be absorbed into a mere abstract timelessness. They are too concrete for that. Why not then take the time-process as an essential aspect of the eternal reality, not negated but transcended? Succession and duration blend in our experience. Man recognizes the flux, the transience of many events and things, but he finds, too, that there are laws, truths, spiritual values, ideals, and conceptions, which abide as true at any time because they have meaning and significance which is timeless.

¹ McTaggart, "The Unreality of Time", *Mind*, October 1908. "The Relation of Time and Eternity", *Mind*, July 1909. Also in *Contemporary British Philosophy*, Vol. I, and *The Nature of Existence*, Vol. II.

² Article, "Eternity", *Encyclopaedia of Religion and Ethics*.

³ Reyburn, in *Mind*, October 1913.

McTaggart has argued that Time is unreal because the past does not exist, nor does the future, while the present is a mere point without breadth, i.e. without duration, or is a mere imaginary line. This argument involves the supposition that nothing can be real which is devoid of fixed or definite unchanging duration, and overlooks the reality of change. It fails to come up to the problem of Time and its essentials. We live through Time, we do not stand still in it. Time is a function of change, and the argument entirely overlooks the reality of changing objects. While they change, they endure for longer or shorter times. Without again raising here the question whether it is not false to regard the present as a point or a line in view of our experience of a specious present or of duration, it can be seen that this argument reverts to a view of the Universe which is static like the unmoved and unmoving One of Parmenides.

That change is a feature of our universe, and a real feature, cannot be denied. It is, of course, a different question whether we consider change to be a single feature, or look on it as bound up with duration and with some element of permanence. It is futile, however, to dispose of Time in the way in which this argument attempts light-heartedly to do. The denial of change has been attempted by some other philosophers, and these have usually denied the reality of Time.

The argument goes too far, for it not only would disprove the reality of Time but also the reality of events.¹ But the qualities of past, present, and future do not involve unreality even if they do not imply continued existence.² Indeed, past, present, and future are not characteristics which in any way belong to the events as events, but only express relations in Time between the event and some other event or events such as my mind knowing or experiencing the event, or the minds of other beings as experiencing. Every event, we may say, is past, present, or future, and the admission of this does not, in spite of McTaggart's argument in a notable article on "The Unreality of Time", involve a vicious circle or infinite regress.³

¹ Leibnitz employed this argument against the view of absolute time.

² The question as to whether we should include within "existence" the past is discussed in our last chapter on "The Nature of Time".

³ McTaggart, in *Mind*, 1908.

There is no incompatibility in the three predicates past, present, future. They can all be true without contradiction. This can be seen by taking a proposition from history such as McTaggart employs, "Queen Anne is dead". This proposition expresses an event which is past, was present, and was future. It is past to us or to George I, it was present on the first day of August 1714, and was future to a man who died in 1710. These statements are true and illustrate how an event can be all three, future, present, and past, but they do not prove that Time is therefore unreal, as Broad, in his argument against McTaggart on this very point, has shown. The fundamental becoming of the Universe brings new events into being and alters their presentness, pastness, or futurity.¹ Indeed, the temporal relations given in these statements are real for all time, they stand independently of the further march of time, being timelessly true. But that does not imply that Time is unreal.

Writing in the recent volume of collected contributions, *Contemporary British Philosophy*, on the nature of existence, McTaggart remarked that if we are certain *a priori* that nothing with the quality of x can be real, we can be certain that any empirically-known characteristic which involves the quality x cannot be true of reality. "It seems to me", he continues, "that one empirically-known characteristic which cannot really belong to anything that exists is the characteristic of Time."² His argument, as expounded sixteen years previously in the article in *Mind*, briefly resolves itself into the following propositions. Nothing can be in Time unless it forms a series Past, Present, and Future (an "A" series). Nothing, again, can be in Time unless it forms a series of Earlier-and-Later (a "B" series). But the Series A is self-contradictory, for every term of it is past, present, and future, while these three predicates are themselves incompatible. McTaggart admits, however, that the time-series is not totally erroneous. The terms which appear to us as a temporal series connected by the relation of "earlier than" form a *non-temporal* series connected by another relation. The A series of McTaggart is declared by him to be unreal because he *assumes* the reality of the purely logical

¹ See Broad's criticism, *Scientific Thought*, p. 83, and our remarks, *ante*, pp. 289,

312.

² *Contemporary British Philosophy*, Vol. I, p. 269.

C series. As a matter of fact the series of before-and-after is not sufficiently appreciated by him. This objective relation is not the same as the subjective relation of past, present, and future.

Although past, present, and future are used of the same event they are so used *at different times*. McTaggart is quite out of order in using the *seeming* contradictoriness of these predicates to disprove the reality of Time. Their meaning depends on time and is relative to time. Omission of this vital primary consideration will, of course, lead to contradictions. Again, we cannot correctly admit that predicates used at different times are contradictory. Judgments and not mere predicates are the real contradictories, for predicates, although different, may *in their turn* be each perfectly valid.¹

McTaggart himself goes on to suppose that there is a state of good which, *sub specie temporis*, lies in the future and is reached in finite time, but is itself endless. The time required to reach it may have any finite length, however great, and we do not know how much evil may await us during that period. We do know, he claims, that all the evil of the future and the past is surpassed infinitely in value by the good that lies at the end of Time. The last enemy to be overcome, he thinks, is Time, so that he thus, although denying the reality of Time, proceeds on his spiritual pilgrimage to Eternity *via* the road of Time.

For McTaggart neither future and past nor better and worse can be really adequate judgments of a timeless and perfect universe. The world in his view is not in Time; it has no temporal characteristics; it is timeless and perfect. He admits, however, some symbolic sense to Time and Values, and says rather cryptically that while future and past, better and worse, are inadequate judgments of a timeless and perfect universe, yet "in the sense in which there is a future it may be an improvement on the past".

McTaggart stands as a great protagonist of the unreality of Time. But although his arguments demand more attention than those based on doctrines of infinity, his statement of the contradictions of pastness, presentness, and futurity is untenable. His scorn of Time, like that of Bradley, rests on a view of

¹ See Broad's criticism given in previous section, p. 299.

the Universe from which Time and Change have already been extracted.

Bosanquet's philosophy is also discourteous to time-succession. The whole is a whole in spite of succession, never because of it. In his *Logic* he suggests that our intellect must construct an ideal objective order, not itself in Time, but in direct contrast with the fleeting sensitive experience of every day.¹ In the same work he replies to the query "Is Time Real"? Everything is real, so long as we do not take it for what it is not. Time is real as a condition of the experience of sensitive subjects, but it is not a form which profoundly exhibits the unity of things.

In Bosanquet's philosophy there is clearly an admission that Time exists, and it is, therefore, for him a feature of the Absolute. But the Absolute itself is not in Time, rather Time is in it. With this statement we have no quarrel; the difficulties arise in the next step, for Bosanquet claims that the whole cannot change. Now, in our view, Time is bound up with Change. It is impossible to deny the reality of Change and endeavour to save the reality of Time. Change involves temporal events, for without these there could be no change. Evidently Bosanquet regarded both Time and Change as contained within a timeless, changeless whole. He cannot deny that they (i.e. Time and Change or Temporal Events) are a feature of the whole. If by the term "whole" is meant the successive, plus accumulated, plus future totality of events ever real at *any* time, the expression is without meaning. If, on the other hand, he does not mean this, then the statement that the whole cannot change is equivalent to saying that the whole exists entirely given, and all novelty or creative effort is a transference of energy or a re-arrangement of matter and motion. In this case novelty is only a conception which arises from a radical confusion of existence and knowledge. Relying on his proposition that $7 + 5 = 12$, Bosanquet argues for eternal novelty, but we must keep our judgments distinct from the fact of existence. Time and Change must be admitted as features of the Absolute. They are within it, but they are none the less real elements in it.

¹ Bosanquet, *Logic*, Bk. I, Chap. IV, pp. 179 ff., pp. 199 ff., and Chap. VI, pp. 273 ff. Also on "Time and Judgment", pp. 85 and 215.

Of course, the whole cannot change because the conception of the whole, as thus laid down, includes all change, past, present, and future. Bosanquet's idea of the whole or the Absolute does not help us to understand the nature of Time save as to delimit it as a *feature* within the whole, a limitation again to which the same argument applies. If the "whole" is thought of at all it must include Time within it, or it would not be the whole. The reference of the problem to the Absolute is a reference to a point which precludes further discussion and further assertion apart from the admission that in that "whole" Time is a feature. We cannot make a whole including Time and then ask if the whole is in Time. The position is contradictory and the question absurd. *Ex hypothesi* we must say "no". If we were to say "yes", apart from a denial of our premise, then the Time in which the whole is could not be the same as the Time that is in the whole. The position is impossible if we postulate a whole or Absolute (a proceeding of doubtful value); we must adhere to our conception that it is what it purports to be, a true whole, outside of which there is nothing, not even Time.

Lecturing on "The Gates of the Future" in his Gifford Course on *The Value and Destiny of the Individual*, Bosanquet has criticized and rejected two doctrines of Time which have played a conspicuous part in philosophy. The first is Bergsonism, the doctrine of endless *évolution créatrice* indeterminate and undetermined, an infinite process in which "the gates of the future are wide open" and in which the present is interpenetrated by the past and streams ever forward into the future. The second is Mediaevalism. By this is meant the doctrine behind the work of *The Summa Theologica* and *The Divine Comedy*, namely, a belief in a temporal human history on earth, and in Time, to be followed at some moment by the end of the world and the passing of souls into an Eternity of heavenly bliss, the tormenting pangs of purgatory or everlasting damnation.

Idealism in the world of ethics implies that, while the ideal is of the present in creation and obligation, it is not actually realized. It must be sought, and the activity of seeking involves work in Time. Its complete attainment is not yet, but lies as an end in the future. Ideals are progressively realized in and

through Time, and it is this realization which gives significance to human history, for it gives meaning to humanity's slow, toilsome, and wavering march through the valley of Time. The temporal process, however, includes in it the realization of eternal values. The blending of the Eternal Life here and now in the time-process of existence is apparent. Bosanquet rightly claims that the Eternal is really here and now and that we do not require to await the completion of humanity's pilgrimage to enter into it. The great enemy of all sane Idealism is the doctrine that the Ideal belongs to the future.¹

"If", he remarks, "by logic we understand with Plato and Hegel the supreme law or nature of experience, the impulse towards unity and coherence . . . by which every fragment yearns towards the whole to which it belongs, and every self to its completion in the absolute", then surely the time-process is of eternal and absolute value and significance. Without it the whole, which is Reality, would be poor indeed.²

For Philosophy, as for Art, the End is not other than its accomplishment and the process of its accomplishment. It is not merely a final stage, it is the meaning and spirit of the entirety or whole. This is seen in music, painting, sculpture, and drama. It is seen, too, in biography. There are no bare events in a man's life. They are expressions of a whole personality, and they are unique items of which we cannot really judge unless we know the whole. Single moments in a man's life ought not to be merely means for other moments, and past and present merely means for the future. As Höffding urges, they will not be, "if work and development themselves retain immediate value and can thus themselves be ends. The child is not simply a man in the making, childhood becomes an independent age, with its special tasks and its own appropriate value. In thiswise every period of life, every part of the course of time, is to be understood. Then will it be possible in the midst of time to live in eternity."³ Eternity will then be recognized as not merely implying the quantitative prolonga-

¹ Bosanquet, *Principle of Individuality and Value*, p. 136.

² *Ibid.*, p. 340. Cf. Webb's insistence on the necessity of Time as a field for activity, *Contemporary British Philosophy*, Vol. II, pp. 356-7.

³ Höffding, *Philosophy of Religion* (English translation), p. 56.

tion of Time, but as an expression for the *permanence of value* during the flux of Time itself.

The teleological conception of the universe necessarily involves Time, but all realizations of *value* do not lie in the future. Human spirits realize some intrinsic values and ideals here and now. Bosanquet has urged us, "if we are revolting from Mechanism, to go, not to History, but to Art and Religion." History is set over against art, morality over against religion. Art and religion are further from the events of the time-process than morality or history, both of which involve that process, particularly history. Some philosophers (as, for instance, Ward) consider that reality is more intimately seen in morality and history; others, like Bosanquet, have held that it is better revealed in art and religion. The antithesis is between "striving" and "enjoying".¹

The distinctive being of the self Bosanquet described as varying inversely as its dependence on externality and successiveness. For him, *durée*, the operative concentration of the self's past history at the growing point of the present, is one with the relative timelessness of a finite self. Timelessness is an essential constituent of Time! At least we must admit the possibility open to the self to possess itself and to commune with its immanent deeper Reality, in a manner which raises it above the flux of time-events, to partake of what may be correctly described as Eternal Life. In the changing aspects of my inner life I remain "myself", self-identical. If I am in Time, Time seems not less to be what it is just for me. Apart from the experience in Time, in which I appear as object to myself and conscious of that self as in Time, I am not. It is only when referred to its focus in myself that the succession in time-experience is brought together as a single and continuous succession. Apart from the self as the subject in which it is held together, it seems to have neither meaning nor existence. Time, therefore, does not appear to be the last word about reality. It belongs, not indeed to me as a mere particular self or subject, but to an object-world that is there for me.

¹ This is a fundamental difference in attitude of mind, revealed in all art and all religion, and, we must point out, within both art and religion. The recognition of this point would vitiate Bosanquet's antitheses.

We can hardly, however, say with Bosanquet that the self is purely timeless. "When I look back and recall", says Haldane, "what I did and felt thirty years ago, I am holding together and comparing past with present. But it is *my* past experience, emotional as well as cognitive, that I am comparing with what I have now. The experience has changed continuously and in detail as well as the experiencer. Although from one point of view it is the same self that has felt and known throughout, there has been, from another standpoint, a time-process, for the self as well as for the not-self. But this time-process has been a time-process none the less for a self that in an essential fashion appears to have overreached time as a factor or moment in its totality, but only as a factor or moment."¹ The actual self is, in an aspect which is a necessity in its constitution, at once present, past, and even future. None the less, time is neither external to it nor its creature. The foundational basis of knowledge and experience is an experience which presents itself as at once in time and out of it. That is why experience cannot be conceived as a thing or even as an event."²

The succession of events in Time is overreached or transcended by Ends which are not themselves events, but which control and mould the significance of the events. Thought itself and Life itself do, in a manner, transcend both Space and Time. Time is still there, but as a factor in a greater whole, which makes it appear surpassed. Thought, for example, is not itself an event, but is rather the basic principle of rationality by which the fleeting forms of our experience are consolidated, united, and rendered meaningful as a single experience. Thought is not transitory like events, it is an enduring principle whose essence lies precisely in its characteristic of endurance throughout the fleeting moments of experience. It is an abiding and uniting principle. Because it is not an event it is, therefore, outside the relation of past, present, and future. However basic the time-experience is, thought is in relation to, or contrast to, events, timeless. Through its abiding qualities, the flux of past, present, and future events is seen as an organic interpenetrating whole.

¹ It is this which induces Dunne to expound his views of planes of consciousness and time for a *serial* observer.

² Haldane, *The Reign of Relativity*, p. 319.

Thought, and with it its normal end, Truth, have not to do with Time directly. Only in so far as Truth may be taken to imply a progressive co-ordination of Ends does it stand in relation to a temporal process. Hence Time is not the last word about Reality, and the opposite of Time is not *la durée*, but Eternity.

Akin to this doctrine of Bosanquet is that of Volkelt in his *Phänomenologie und Metaphysik der Zeit* (1925). He relates his conception of the Timeless to Personality and to the concept of Value. At the close of his second part, incidentally the best part, he discusses *Das zeitlose Gesehen* and *Die Zeit und der Sinn des Lebens*.¹ Like Bosanquet, a writer on Art and Ethics, he resembles Bosanquet in his attitude to the problem of Time, Personality, and Eternal Values. It is the position of McTaggart and of Plato. "Das zeitliche Gesehen erhält seiner Sinn erst durch Einordnung in das ewige Gesehen."

Bosanquet deprecates the current "moralism" which involves an attitude of mind obsessed by the events of the time-process. This attitude, even when expressed in relation to ideas of progress and ethical reform, is the antithesis of religion which stands, in his view, for a recognition of non-temporal values in the time-process, an enjoyment of "Eternity" in the midst of Time. This same point of view he shares in some degree not only with Bradley and McTaggart, but also with Royce, Von Hügel, Wicksteed, Mackenzie, and Pringle-Pattison.

Pringle-Pattison, in his discussion of Time and Eternity, shows (as did Ward, McTaggart, and Mackenzie) that the latter term is ambiguous, and that we use it in three different connections.²

1. To denote unending extent of Time.
2. To denote that which is timeless.
3. To denote that which includes time, but somehow also transcends it.

¹ Volkelt, *Phänomenologie und Metaphysik der Zeit*, XXI, ss. 188-200. See also Cohn, *Theorie der Dialektik*, on Timelessness, ss. 74-83; and Litt, "Das Zeitlose" in his *Individuum und Gemeinschaft*, ss. 158-63.

² Pringle-Pattison, *The Idea of God* (Lec. XVIII, "Time and Eternity"); McTaggart, "The Relation of Time and Eternity", *Mind*, July 1909; Mackenzie, "Eternity", article *Encyclopaedia of Religion and Ethics*.

The first usage, referring to mere endlessness, is the popular one, but it has found little favour in philosophy. The second is applied (particularly by McTaggart) to timeless laws and truths. Philosophy attaches most importance to the third usage, which is not, be it noted, a mere negation of temporal conditions, but includes temporality within itself and transcends the limitations of such temporal conditions.

This use of the term Eternity has been prominent in British philosophy in recent years. To the testimony of McTaggart, Mackenzie, and Pringle-Pattison we may add that of the metaphysician and sociologist, Hobhouse, and the theologian, Temple, both contributors to the recent interesting volumes of collected testimonies, published as *Contemporary British Philosophy*. Their comments on this question are so direct as to deserve quotation.

"The conception of development in the whole", writes Hobhouse, "raises a speculative question. When we say the whole develops, we mean the structure of the whole as it is at a given time. This is a mere section through the greater whole which contains the entire process of development. This whole, of course, does not develop, for all development is within it. But does development begin in time and does it end? Time has a dependent existence. It is the abstraction of something common to all Processes and that is why there cannot be, as some physicists are suggesting, many time systems, for all these are comparable with one another. Process is an adjective, a warp on the woof of permanence, wherein the development of an imperfect structure is made possible. Reality as a whole is Eternal, but this does not mean either that it is timeless or changeless or merely of infinite duration. *Eternity and time are not quantitatively but qualitatively distinct*. Eternity, if we can understand it at all, means the gripping together of past and future in a present in which there is no evanescence or perishing. In this conception time is encapsuled as a factor but corrected, so to say, by its converse. As eternal, therefore, Reality contains time as the factor through which the relation of harmony to its conditions takes effect. In eternity the entire process of development would be present together like the movements of a body laid out in a spatial curve. But would time end with the completion of the process or should we

conceive it as changing its function and surveying the activity without genesis, which would seem to express harmony fulfilled? Or should we put it that time, ceasing to be a distinct aspect, would be merged in eternity? The point of difference is that in time things perish, and as long as there is disharmony it is necessary that they should perish. Even viewed *sub specie aeternitatis* they must be viewed as being overcome. In harmonious activity, on the other hand, everything is conserved. Time, then, might be conceived as having a beginning and an end in eternity along with the development it serves. Reality does not perish and the end of its development is not the peace of death, but the harmony which keeps all things alive.”¹

Temple, more briefly, says: “When we rise to the stage where the term Person may be applied, we find that the influence of circumstance on conduct is still less and the individual character is held definitely responsible for its reactions. Here sense of duty and, with it, sense of rights is central. Personality shows itself most of all by the capacity to form or accept a purpose and deliberately organize life and conduct for its fulfilment. For purposive Personality, not only the present but also the past and still more the future, is apprehended as important, it rises above time in the sense of surveying the course of Time, but the process of Time is essential to it. This consideration is fatal to those forms of absolutism, which relegate all succession to a position of ultimate unimportance. The Divine Will wherein Theism finds the unifying principle of Reality must, if it is reasonably called Will at all, achieve its purpose in the process of Time while itself surveying, as from without, or above, the whole course of Time.”²

The outcome of these considerations and their influence in the formulation of any scale of values or practical philosophy has been emphasized by Royce in his Gifford Lectures on *The World and the Individual*. “The issue here involved has a significance not only theoretical but also intensely practical. . . .” “Time is a concept of fundamentally practical meaning. The definition of the eternal, on the other hand, has very close relations to the question as to the ultimate

¹ *Contemporary British Philosophy*, I, pp. 185–6.

² *Ibid.*, I, p. 419.

significance of all that is practical. Any rational decision as between a pessimistic and optimistic view of the world, any account of the relation of God and Man, any view of the sense in which the evils and imperfections of the Universe can be comprehended or justified, in brief, any philosophical reconciliation with religion and life must turn in part upon a distinction between the Temporal and the Eternal and upon an insight into their unity in the midst of their contrast."¹

Royce makes considerable use in his work of the "specious present", the precise nature of which we shall discuss critically in our next chapter. He recognizes ambiguity in our use of the term "present". "The term *present*", he points out, "is used both to name the temporally present when it is opposed to whatever precedes or succeeds this present and also to name the observed facts of a succession in so far as they are experienced as constituting one whole succession. . . ."² ". . . *Present* in what we may call the inclusive sense of the term is any portion of real time with all its included events in so far as there is any reason to view it as a whole, and as known in this wholeness by a single experience. *Present* in what we may by contrast call the exclusive sense is any one temporal event in so far as it is contrasted with antecedent and subsequent events, and in so far as it excludes them from co-existence with itself in the same portion of any succession."³

Royce thus contrasts one event perceived as present to which others stand in the relation of "gone" or "not yet", with the "present" as applied to a succession seen as a whole. He also admits that this time span of ours is an arbitrary feature and limitation of our perceptual power, but does not recognize that a more fundamental ambiguity in the term arises from the subjective and the objective contrast. The subjective present is largely as he describes it, but the objective present is characterized differently, as it depends on continuous change. He does not admit this to the title of present, firstly because he is too wedded to the psychological view, and secondly because he wishes to use the "specious present" for his arguments about the Eternal Absolute consciousness of

¹ Royce, *The World and the Individual*, Vol. II, p. 112. Lecture on "The Temporal and the Eternal".

² *Ibid.*, Vol. II, p. 139.

³ *Ibid.*, Vol. II, p. 140.

the Time-Series as a whole in accordance with his general Idealistic position.

Time, which he correctly recognizes as bound up with change and succession and as possessing a definite directional quality, is finally for him the form of practical activity, the form of the Will. "Only in terms of Will, and only by virtue of the significant relations of the stages of a teleological process has time, whether in our inner experience or in the conceived world order as a whole, any meaning. . . . A whole world must needs be, when viewed in its wholeness, an eternal world."¹ He claims that the whole real content of this temporal order, whether it is viewed from one temporal instant as past or as present or as future, is *at once* known, i.e. is consciously experienced as a whole by the Absolute, to whom presumably all events, past, present, and future are visible at once in a single whole. The concept of Eternity from this point of view does not exclude Time, but definitely includes it in a whole having significance. The whole is a *totum simul* as it was for Aquinas, but Royce's view is more immanent and attempts to unite organically the temporal and eternal in a way which the mediaevals would not have admitted.²

Royce argues from the analogy of a musical composition and the manner of our awareness of it to what he considers to be the awareness of the Time-process by the Absolute Eternal Consciousness. Like so many arguments of this kind the difficulty of the critic is to determine just how far the things compared are really analogous. There is a vagueness about Royce's references to the music which is not a little irritating. What he wants to argue is clear enough, but whether it is clearly argued is very doubtful. Is he considering the composi-

¹ Royce, *The World and the Individual*, Vol. II, pp. 132-3.

² On this point of relation to mediaeval conceptions, Royce himself says: "This definition of the relations of the Temporal and the Eternal accomplishes all the purposes that are usually in mind when we speak of the divine knowledge as eternal. That eternity is a *totum simul*, the scholastics were well aware; and St. Thomas develops our present concept with a clearness that is only limited by the consequences of his dualistic view of the relation of God and the world. For after he has indeed well defined and beautifully illustrated the inclusive eternity of the divine knowledge, he afterwards conceives the temporal existence of the created world as sundered from the eternal life which belongs to God. And hereby the advantages of an accurate definition of the eternal are sacrificed for the sake of a special dogmatic interest" (*The World and the Individual*, Vol. II, p. 143).

tion of the music by the composer or its performance to a listener for the first time or its performance on a subsequent occasion? It is important to ask this in view of the weighty view which he hangs on to this analogy, a view which seems "more sublime than solid".¹ The simple fact of our perception of the successive notes of a melody as a whole is the actual psychological feature of the "specious present" correctly described by Royce up to the point where he takes this to be the real present. We shall not here raise a fundamental difficulty about the specious present which, although vital, is not relevant to the nature of the argument here.² The issue at the moment is whether the extension of this idea to a supposed Eternal Consciousness is warranted on the analogy of music or anything else.

He passes unwarrantably from our awareness of the successive notes of a musical composition to the awareness of the whole time-order, disguising difficulties which cannot be passed over in silence. We must know more precisely what he means about the music, in the form of the questions we have already asked. If, for example, we listen to a familiar work, say the *Sonata Pathétique*, we, as Royce says, regard it as significant as a whole, not simply leading up to a final chord, which is alone significant. We follow the successive chords as a whole (as he says). But in this case we know what is coming. If, however, we are hearing such a work performed *for the first time* we do not, at the end of the first movement, know what the melodies of the second and third will be. This makes considerable difference to the view of the future, if we are to use the sonata as an analogy for the time-series. Again, it has to be remembered that the piece, so far as performance goes, is still going on, and we are hearing it for the first and only time. We do not even know where about in the piece we are. Royce might answer that the composer knows, and that he can see it as a whole. This would be a more probable and useful line for his argument, but he should say so clearly. If a piece is now being performed for the first time to persons who have never heard it before and who arrive at the concert late and leave early (as human beings do), they cannot sense

¹ The phrase was used by Reid.

² This is discussed in our next chapter on "The Nature of Time".

the piece as a whole. But it may be urged that this is Royce's point, the composer alone sees it as such a whole. But even for him there would be a difference between what had been performed at the concert up to a given time and what was still to come, even although it all existed in his own mind. This distinction is not the easy distinction of mere succession that Royce urges. It is the greater distinction of performed successions and those unperformed, a very different matter, involving the really temporal distinction of past and future, the actual distinction of what has happened and what has not. Even if we admit that the composer knows all we must admit, too, that he knows how much of his work is not yet performed (at the concert) at a given time. Royce is quite prepared to admit this, but it is nonsensical to attach it to our awareness of succession in the piece of music. His whole handling of the reference to music is obscure and, although superficially plausible, will not bear critical examination. Carried far enough it might, in some hands, involve the admission that possibly even the composer does not know his music as a whole, being rather in the act of composing it. Apart from Royce's unsatisfactory references to "music composition", it is clear that he considers that there is a composer who knows the whole of the piece. God, in his view, knows the whole time-series, past, present, and future. Yet Royce's own constant references to *our* knowledge of music would only justify the assertion of a divine specious present which covered from the beginning of events up to the present, and would not include the future at all. If Royce wished to maintain the doctrine of Divine Knowledge of all time, then he should have done it independently of *our* specious present in listening to music. The Mediaevals, whom he slights, were more definite and more logical. They argued not from the specious present, but from their conception of the Eternal as all-knowing and as knowing all of the time-process. Royce considers himself modern in playing with the limited psychological doctrine of a specious present and stretching it as a child stretches elastic to include too much. In the process, of course, it breaks. The specious present can never be extended in such a manner, and arguments on God's knowledge of the future, if urged at all, are better on other grounds or possibly

better still not urged at all.¹ All such arguments aim at establishing a quantitative view of the Eternal, they attempt to grasp what they confess to be infinite in limits that are finite. They would be better employed in elucidating further the conception of the Eternal as qualitative, as truly timeless, not as a *totum* or stretch of the whole of Time, which whole they do not know. They do not even know if it be a whole, whether it be limited or unending. The Eternal as meaning the timelessly true is of more spiritual significance, and its elucidation a more commendable and more possible task. Here, as in other cases, it is quality not quantity that matters.

Royce's doctrine of Time and Eternity is also based (in addition to his use of the "specious present") upon an examination of the conception of infinity. The world in Time is regarded as a *whole*, is abiding, changeless and eternal, but from the point of view of the parts, it is a series of events that is infinite and changing for ever. Time is not a mere present, for the present assumes the past and future.² Time in its wholeness is Eternity. All events, past, present, and future, are present in their wholeness to the final insight.³ The Eternal as thus conceived would not be timeless, but rather that which includes within it the whole of Time. Royce, although he stresses temporal order, denies its ontological value. The events of the temporal order are divided, with reference to the point of view of any finite Self, into what *now* is, and what *no longer* is, and what *is to be* but is *not yet*. These same events, however, in so far as they are viewed at once by the Absolute, are for such view all equally present. Thus their presence is the presence of all time practically as a *totum simul* to the Absolute.⁴ But as Taylor reminds us, "The direct insight of the Absolute Experience into its own internal meaning or structure cannot be adequately thought of as mere simultaneous awareness of the detail of existence."⁵ Royce's distinction of the Absolute and God, Bradley described sarcastically as the action of a hesitating dog attempting to follow two masters. The Absolute

¹ Royce is not clear as to (1) whether the composer is *composing* in the presence of his audience, or (2) whether the piece, *already* composed, is now being merely performed.

² Royce, *The World and the Individual*, Vol. I, pp. 407-10.

³ Ibid., Vol. II, p. 337.

⁴ Ibid., Vol. II, p. 141.

⁵ Taylor, *Elements of Metaphysics*, p. 264.

considered as God plus His creatures (not a personality) cannot have foreknowledge for, as Royce himself admits, neither God nor man can foreknow what a free agent will do.¹ Royce says, "The eternal insight observes the whole of time and all that happens therein, and is eternal only by virtue of the fact that it does know the whole of time." The Absolute has eternal knowledge, yet he says that God does not *foresee* (or see). If, for him, God and the Absolute are one this is inconsistent.

In the philosophy of Royce we are told that the Eternal view of a time-process is not a view of all stages together, not, that is to say, what Boethius, Aquinas, and other mediaevalists called a *totum simul*.² The Eternal view of a Time-process or sequence of events is the grasp of it, or them, as elements in a completed *purpose*. Eternity is a qualitative conception and it is also an organic one. Royce, it is true, tends to a subjectivity of view which confuses Time and our awareness of time. He does, however, rise to an objective standpoint in seeing that purpose can only be spoken of in relation to real succession in Time. Purpose, no less than motion, is impossible apart from Time.

Von Hügel (and with him Hocking, as well as writers on mysticism, such as Delacroix, Inge, Rufus Jones, and Evelyn Underhill) recognizes in man a capacity for ascending to a level of experience which transcends the temporal sequence of events. Human life is, in their view, capable of these "quasi-simultaneities" and achieves its experience on a plane lower than that of the eternal life of God Himself, but indefinitely above the merely mathematical framework of bare succession which is without duration. The life of man with his temporal experience lies, as Von Hügel has expressed it, "between the pure simultaneity of God and mere clock time".³

This leaves scope for the really temporal element in human experience to be grasped and seen in its proper perspective.

¹ But Ward and Taylor expressly state the opposite: foreknowledge does not preclude free-will.

² See Chapter II of the present work, "Mediaeval Conceptions of Time". "Eternity" = realm of values in Time, but true at any time. These values Time does not make nor can it destroy. "Eternal Life" is loyalty to those ideals that are true at any time.

³ Von Hügel, *Eternal Life* (conclusion).

There are qualities inherent in transience which no purely eternal process or simultaneity could replace. No doctrine which regards the transience of time as unreal, while trying to retain it for reality as an order, can avoid the stern accusation of robbing the time-process of history (both racial and individual) of its significance in the scheme of things.

"Retreat from history", says Hocking, "is the mystic's temptation. And he who dwells in the universal alone, becomes false; the unhistorical mystic is a liar."¹ Von Hügel, repeating Bosanquet's view that we need not wait until the end of Time in order to grasp the Timeless, asserts that we realize Eternal Life amid the mere transience of the temporal processes. Combining in some degree the belief in abiding Reality, which characterized the work of Parmenides, Plato, Plotinus, Aquinas, Spinoza, Hegel, and Christian Theology generally, with the insistence on the reality of change as exemplified in the philosophy of Bergson, this great Catholic thinker finds in the conception of duration, as outlined by the French philosopher, an expression of the fact that there is no real transience in the time-process. Bergson himself, of course, has not pushed his thought so far. Even an admission that Time is eternal would involve a supplementing of his doctrine of pure change, if not an entire rejection of it in favour of a theory that, while change and time are real, they are only true of the parts, not of the whole itself. Bosanquet took this view,² as did also Royce and Wicksteed, whose essay on "The Religion of Time and of Eternity" unites the finest aspects of Mediaevalism with much modern Idealism.³

We may maintain the Reality of Time, but doubt its ultimacy. It is not the last word about reality. However much we stress the *Devenire*, the Becoming, it must be remembered that our life has value and significance only because, and so far as, it realizes in fact values which transcend Time and Becoming and are true at any time and for all time.⁴ Ultimately, perhaps,

¹ Hocking, *The Meaning of God in Human Experience*, p. 512.

² In his Gifford Lectures, *The Principle of Individuality and Value*, and *The Value and Destiny of the Individual*, and in *The Meeting of Extremes in Contemporary Philosophy*.

³ Royce, especially Vol. I, pp. 420-2, and Vol. II, pp. 113-26, 130-42.

⁴ Bradley speaks similarly, but says Time and Existence. Why Existence? (*Essays on Truth and Reality*, p. 465). We find Eucken insisting on this point, for while he did not deny the reality of Time, he considered that "thought does not

only Beauty, Goodness, Justice, Truth, and Love are real. They appear in our world in and through the events of the time-process, and it is they, and God in them, or God as them, which give our world its meaning, significance, and its true and eternal reality. To appeal to Ends, to the future, is just to say that the time-process is a whole. We would need to know the whole to have its history. Changes would then cease to be paradoxical and become expressions of the fundamental unity of the whole. Time is transcended from this point of view. The process is not, however, a syllogism, a law, or a proposition. It is not timeless. The difference between life and logic lies just in this. Reality is temporal and concrete. Time cannot be blotted out from our conception of Reality. Time is more than the passage of awareness of the procession of events. It is the form of the movement of life itself in its creative advance, its conative tendencies and processes to ends. "Time is the abstraction of unachieved purpose or of purpose on the way to achievement." The eternal view of a time-process is not mere simultaneity of vision of all parts, given to man in succession, but the view of them as a whole or as members of a completed purpose. The entire objective order of things is not, it can be argued, temporal. The conceptions of Justice, Truth, and Beauty, and the laws of mathematics, are not temporal, for they belong to a system of categories and values for which time is irrelevant.

"Time", says Von Hügel, "in the sense of *duration* is for us men not a barrier against Eternal Life, but the very stuff and means in and by which we vitally experience and apprehend that Life." Man's temporal life is neither a theory nor a vision, nor something ready-made that automatically unrolls itself. It is a drama with tension, struggle, sacrifice, suffering, and joy. That drama is enacted through the medium of time, the battle is fought in the field of temporal, finite things and events.

drift along with time ; as certainly as it strives to attain truth it must rise above time and its treatment must be timeless". For this idealist with his doctrine of spiritual activism the Universal Spiritual Life persists as eternal and universal, revealing itself in time. His arguments about the timelessness of logical truths are valuable, but we must enter a *caveat* against his views of the past as changing. The past itself cannot change ; it is eternally fixed. Our attitude to and knowledge of it may, of course, and does change, as well as the influence of that knowledge upon present action. But all this is quite another matter.

It is not a single-handed fight, but one in which there are innumerable combatants and marchers groping onward. They struggle on to achieve some ends, some ideals which they have fashioned and set up for themselves. They are ever seeking to escape from change, from the mere succession of events, and to grasp, to realize, and to enjoy those ends as eternal values which, permanent, timeless, and unchanging, are the very attributes of God Himself in whom, and for whom, Time and Eternity are one.¹

The culmination of idealist thought in the sphere of contemporary metaphysics is found in the neo-idealism of the Italian thinker, Gentile. His philosophy is based on a view that mind (or spirit) alone is the supreme reality, and that we must conceive of mind as *atto puro*, pure act, pure activity. Reality is characterized as becoming, *devenire*. While for Alexander the advance of events is due to the inherent restlessness of Space-Time, for Gentile this arises from Thought, Mind, or Spirit as a development in an idealistic direction of the initial consciousness which is the immanent *élan vital* in evolution. We have noted the objections to the subjectivity of Bergson's views. Gentile is even more extreme. He is at pains to distinguish his idealism from that of Berkeley, with whose subjectivist thought it has at first apparent obvious connections. He agrees with Berkeley's *esse est percipi*, and approves the view that reality is conceivable only in so far as the reality conceived is in relation to the activity which conceives it. To conceive a reality is to conceive at the same time, as one with it, the mind in which the reality is represented; and therefore, Gentile argues, the concept of a material reality is absurd.²

Berkeley's error, he claims, was in explaining reality as the eternal thought of God, of which all human thoughts are but rays. Gentile attempts a transformation of Berkeley's Idealism into one in which a transcendental point of view is introduced. This he explains as the view obtained when, in the reality of thinking, we see our thought not as act done, but as act in

¹ Von Hügel, *Eternal Life*, p. 386. It is for this reason that the problem of Time is important for the philosophy of religion, as Webb rightly notes in his contribution to *Contemporary British Philosophy*, Vol. II, pp. 356-8.

² Gentile, *Theory of Mind as Pure Act*.

the doing. This act we can never absolutely transcend, since it is our very subjectivity, our self, and we can never objectify it. Thus Neo-Idealism conceives reality as the continuous thinking activity of a transcendental thinker. Moreover, each human thinker in his transcendental activity of thought is that transcendental thinker, although the object of each human thinker is never the whole of the object created in the thinking of the one universal thinker.

Mind, then, is viewed as pure process and is the ultimate reality. The material world is not real, but only a manifestation. Space and Time are the two forms in which the universal thought or spirit sets itself out. They appear to be necessary because the reality, which is spirit, is also activity, development. It is impossible to conceive of a world of space and time existing either before or independently of mind. "The forms of space and time are neither antecedent nor consequent. If the forms are the functions by which the object of experience is constituted, then activity can be nowhere else but in experience. Space and Time cannot be conceived as empty forms to be filled, as one would fill an empty vessel, with single presentations of sensible experience." Time, Gentile remarks, is the setting out in space of the unity of Space. Time, like Space, is part of the multiplicity engendered by spirit. "We cannot", he admits, "fix this multiplicity before us, neither in its whole, such as it is, nor in any of its parts. From beginning to end it is multiplied into a multitude of images of its whole or of its parts, and so is prolonged into the past or into the future.

More definitely, he says finally: "We are not in Space and Time; they are in us." Whatever is unfolded, extended in space, or unrolled in successive stages in time, is in us. This is pure subjectivity and involves, like Berkeley's Idealism, denial of a material world as independently and objectively existent. Even if "us" means, as it undoubtedly does, the transcendental ego, not the empirical self, it amounts only to a reduction of Space and Time to forms of activity of mind. Gentile will have none of Space or Time or Space-Time as real. The reality for him is not Time, but Mind or Spirit. He claims that Reality is neither spatial nor temporal in its essence, for it is Mind, and Mind is neither in Space nor in Time. This does not mean that no *form* of reality may be presented in Space and Time,

but it does mean that Space and Time are not adequately conceived when they are supposed to exist in pure abstraction and as ultimate irreducibles. Gentile thus opposes Alexander's view of Space-Time as Reality, and he differs from him on the status of Mind in the Universe, but both realist and idealist agree that the universe is essentially *historical*. "All moments of time", says Gentile, "converge in a present which is not merely situated between past and future, but is a negation of all temporal multiplicity and succession, an eternal now."¹ This "compresence", this eternal present, on which all rays of time converge and from which all irradiate, is the intelligibility of Time. He suggests that Time is only unintelligible when we set it above us and do not admit its concreteness. We cannot explain it away as an abstraction; it is for him, as for Croce, an essential feature of the Universe.

"To doubt the intelligibility of Time is", as Mackenzie remarks, "to doubt the intelligibility of life itself. Well, if we cannot understand it when we think of it as fleeting, we may perhaps succeed better by thinking of it as eternal." To which we would add the query, "In what sense is eternal used here?" Mackenzie obviously means enduring as opposed to fleeting. It is easier to *think* the enduring than the fleeting, or, as Alexander puts it, our minds are more susceptible to duration than to succession. But it must be borne in mind that however much easier it is to conceive the enduring nature of Time, it is precisely an understanding of its fleeting character that we require to understand its nature. Even Idealism cannot explain away Time.²

Such are the discussions of the problem of Time in contemporary metaphysics, from Guyau, Bergson, the Realists, and Pragmatists to the Idealists. They are abundant evidence of the validity of Alexander's words about the discovery of Time in recent years. They are evidence, too, of the general soundness of Bosanquet's point made in one of his last publications, *The Meeting of Extremes in Contemporary Philosophy*. No fact in

¹ Gentile's view in *Theory of Mind as Pure Act* (chapter on "Space and Time").

² Cf. Reyburn, "The aspect of succession is not a mere hindrance to totality, but the means to it." "Idealism and the Problem of Time", *Mind*, October 1913, pp. 493-508.

contemporary metaphysics is more striking than that the supposed extremes of idealist and realist viewpoints converge on this problem of Time. Too much may be made of the distinction of realism and idealism. The terms are, as Bosanquet himself urged, "traditional batteries rather than names of precision". Hegel, a thinker whose whole philosophy has been in many quarters strangely misrepresented, went farther and claimed that "such expressions as subjectivity and objectivity, reality, and ideality, are simply vague abstractions; the contrast of idealistic and realistic philosophy is of no importance".¹ We find Alexander, in speaking of the age-long controversy of Idealism and Realism, remarking that "no sane philosophy has been exclusively either". Not all the thinkers whom we have discussed can be readily classified. What are we to say of Bergson and of Alexander? the latter obviously a realist with great sympathy for idealism; and when we think we have a true realist in Russell, we find him admitting some truth, more easy to feel than to state, about the unreality of Time, which has a very idealistic echo.

Too much, we repeat, has been made of these distinctions, and too readily have realists mistaken idealism for Berkeley's philosophy and erroneously equated both with subjectivism. Yet in spite of this, these frequently misapplied labels do indicate something. The realist and the idealist look at reality from two diverse points of view. Briefly, for the modern idealist mind is the creative principle and ultimate form of reality, while for the modern realist the Universe is a realm in which mind exists, or minds exist, on equal terms with other finite things, and these things exist objectively apart from mind's awareness of them. For Alexander, mind is merely one in a democracy of things. Although the idealist frequently looks on time too subjectively and often ignores objective Time, yet the extreme idealist and the extreme realist are in striking agreement about the importance of Time. For both alike the Universe is historical through and through. Gentile and Alexander are both convinced of this, however little else

¹ Hegel, *Philosophy of Religion*, III, p. 169. See also *Logic* (Wallace ed.), p. 413, and the reference to this point made in Dr. Turner's *Theory of Direct Realism*, Chap. I. The remark of Bosanquet is in the Preface to his *Meeting of Extremes in Contemporary Philosophy*.

they have in common. This is largely because, if we seek to examine Time, we find ourselves examining Reality. If we set out to investigate Reality we cannot ignore Time, for even if we think the whole itself to be timeless, we must recognize Time within that whole. Hence, as Alexander says, Time has been discovered, not that we have waited until to-day to become familiar with Time, but that we have only just begun in our speculation to take Time seriously and to recognize that Time is an essential ingredient in the constitution of things. If the Universe is *historical* in character, then the determination of the nature and status of Time in the universe is a crucial problem for philosophy to-day. The problem is, as Bosanquet asserted, the central crux of philosophy, and a philosophical position is definitely characterized by the attitude adopted to the course of Time.¹ Whether it be held that the aim of philosophy is to find and define for man his place in the cosmos and his attitude to it, or that philosophy must abandon large synthetic speculations and devote itself to critical and analytic work, an examination of Time is imperative for the philosophical thinker of to-day. He may be inclined at first to lay it aside as an ultra-technical point which has little bearing on a general philosophy of life and things. But a study of Time is a necessity for a critical and analytic philosophy. It is also the necessary introduction to any sound and synthetic attitude to the Universe and to the complex problems of human activity in its conflicts and its larger, nobler aspirations. Such a study must be, in short, the foundation of any philosophy.

In the present chapter the details of the treatment of Time in contemporary metaphysics have been given. All aspects of the question are here to be found. The contemporary metaphysics of Time is the culmination of many tendencies of thought of earlier centuries, when Plato and Plotinus, Augustine

¹ The main object of Mr. Wyndham Lewis's work, *Time and Western Man* (1927), appears to be a protest against the time-cult in modern literature and philosophy. It is a pity that he gives us such a jazz-review in which Bergson, Alexander, and Whitehead appear on the stage with Anita Loos, Charlie Chaplin, Joyce, and Spengler. The book does little to help forward an understanding of Time as a philosophical problem.

and Aquinas stated their views, or Newton and Locke, Berkeley and Hume wrestled with the problem. We have realized the importance of Kant's treatment (inadequate in itself) together with that of his successors who departed from the subjective view of it as "inner sense" and raised the issues between mental and physical time as well as that of Time as percept and concept. We have noted the interest attaching to the measurement of time and have seen that this gives no help towards ascertaining its nature, which is strictly a metaphysical problem. The psychological treatment of time is equally inadequate. It is not too much to say that for all the differences between Kant and Bergson, nevertheless Bergson continues the view of time as "inner sense". It is, as for Kant, subjective, *perçu et vécu*. Realism, on the other hand, stresses the inadequacy of this view and upholds the objectivity of Time, rejecting Bergson's fallacy that objective Time is really Space masquerading in disguise. There are special difficulties in Alexander's Space-Time, as we have noted, but with Whitehead, Broad, and Russell he rightly emphasizes the objective character of Time. Then we find in the idealists an attempt either to dismiss Time altogether as an illusion or in the less extreme thinkers an effort to see it against the background of the timeless and unchanging.¹ It is the old problem of Heraclitus and Parmenides, with Bergson and Bradley in the modern rôles. Only the permanent can change, and so we must look upon Time as a feature contained in the Universe and not to be explained away. It is as real as any other feature of it. We must insist on Time as objective in character. No merely subjective view, which describes it as "inner sense", is adequate or true. Time is never merely our awareness of it, and Time is never merely, as Gentile claims, "in us". It is a feature of the external world, not an entity existing in itself (or merely a system of relations), and it is given in and with the events of that outer world in their duration and succession. But at this stage we may well pass on to state our own conclusions and views as to the nature of Time.

¹ Great stress was laid by Bosanquet upon the Hegelian principle, "The Real is the Whole". Mind tends ever towards wholeness, so that final emphasis must be laid upon the Whole as the Real, not mind or spirit as such. This idealism stresses the *monistic* rather than the mental or spiritual element in the idealistic view of the world.

CHAPTER VII

THE NATURE OF TIME

Time as a Percept and as a Concept. Characteristics of the Time-series. Union of succession, simultaneity and duration. The limits of the psychological problem. Investigation of our Time experience. Criticism of Ward's view of our sense of past, present, and future. Time and attention. Memory and temporal signs. Relation to purposive activity. Our appreciation of length of Time. Abnormal cases of Time-awareness. Time and events. Before and after relation fundamental. This related to duration in the Specious Present. The moment of experience. Illusion of the Specious Present. Subjectivity of Bergson and his criticism of physical Time. Time not merely our awareness of it. Problem of moments and events. No events, no Time. Time not a mere abstract form. Physical and mental Time. Time not merely a relation. Three Theories: Absolute, Relational, and Relativity. More than change. Past, Present, and Future. Subjective and objective meanings. Before-and-after inadequate. Features of Time. Directional quality. The ever-changing Present. Nature of the Future. Criticism of Dunne, Flammarion, and Osty. Time as subjective. Inadequate view. Time as objective. The metaphysical Concept of Time. Time and Existence. Time and Positive Idealism.

Threefold is of Time the tread;
Lingering comes the Future pacing hither;
Dart-like is the now gone thither;
Stands the past aye moveless foot and head.

ALL discussions of Time lead sooner or later to fundamental problems of a metaphysical kind. To ask what is the nature of Time is, in effect, to ask what is Reality, and, on the subjective side, as Guyau insisted, to investigate our awareness of time is to raise fundamental problems of the origin of experience. Neither psychology nor physics attempts to grasp the problem of the nature of Time in its full significance; the one is merely concerned with our subjective awareness of time and the other confines itself largely to considerations of measurement. The problem of the nature of Time remains therefore a metaphysical problem. This has become clearer in the advance of thought.

The value of Locke's contribution to the discussion of Time lay in his recognition of both physical and mental time. Kant recognized that the whole problem was more than physical, that it was metaphysical. Unfortunately he remained in too subjective a position, and his treatment of Time as "inner sense" was not satisfactory. It had the merit, however, of bringing out

the essential problem of the relation of the order of our perceptions to the order of objective events. Although Kant's treatment of this question was faulty, it is his merit to have grasped the problem. This aspect was further investigated by Sigwart, who raised the problem of the measurement of time which was developed independently in the field of physics. The paradox of the Michelson-Morley experiment remains a difficulty, and until the *positive* results obtained at Mt. Wilson are further substantiated, and, we believe, the nature of light further investigated, it is impossible to erect theories upon *this* experiment. In this field the most important work has been done by Cassirer, and the importance of his discussion of the nature of the concept cannot be exaggerated. The physical concept is not the psychological concept, and the psychological is not the metaphysical. We cannot seek refuge from the inadequacy of physical concepts by such a purely subjective method as that of Bergson. The existence of objective time cannot be ignored or explained in terms of space. Here the realist has a valuable contribution to make by his insistence on Time as an objective feature of existence. Broad's work is of very great importance and must be contrasted with the idealist arguments of Bradley and McTaggart, which, as we have argued, do not disprove the reality of Time as a feature of the Universe. Yet, as Russell urges, there is a sense in which Time seems unimportant, and this is simply because, as Bosanquet has suggested, Time must be regarded as within the whole, which is the Universe. Time is within it, and it is not true that there is Time outside the events of the Universe. That whole is not itself in Time.

Many of the difficulties in the discussion have arisen because it is not always recognized with sufficient clearness that Time is perceptual as well as conceptual.¹ Further difficulties arise because some writers refer to mental time and to physical time without making clear with which they are concerned. The examination of the "specious present" and other problems of a psychological kind brings out this distinction. Our awareness of time must never be equated with Time, objectively considered. Again, many writers speak as if we must inevitably

¹ E.g. Hume in his arguments about divisibility confused and interchanged perceptual and conceptual Time. *Essay*, sec. xii, pt. 2.

choose between the Absolute Theory, the Relational Theory, and the Relativity Theory. There is no necessity for the metaphysician to give his allegiance wholeheartedly to one of these theories. There are serious inadequacies in each, as we shall presently maintain. If we reject the Absolute Theory, we do not escape difficulty by claiming that time is merely a system of relations. If, too, we confine our view of time to that expressed by the Theory of Relativity, we fall into an error which Plotinus long ago saw clearly, the mistake of assuming that measurements are an entire clue to the nature of the thing measured. The conception of Time as a whole with past, present, and future involves its own particular problems. To some of these essential problems we now turn.

I

At the outset we must take note of a dual employment of the term Time, which has frequently led to confusion in all discussions of its nature. We *perceive* time; we are aware of certain amounts of duration and also, usually, of a succession of events. This knowledge is at the perceptual level of experience. Time is a percept. But as we increase and organize our knowledge, and bring to bear our powers of analysis, synthesis, and abstraction, we come to a concept of Time. Perceptual time and conceptual Time are not quite alike in their characteristics, or more strictly we may say that time as perceived is not identical with Time as conceived. It is most important to recognize this distinction and bear it in mind, for some things which are true of Time as *conceived* are not true of it as *perceived*.

For instance, time as perceived is always limited. We never perceive the whole of Time. It is also perceived as sensibly continuous, as having a certain directional quality; it is transitive and related in its content to the subject at the moment of experience. Only if the wider, *implied* temporal perspective and the time-span immediately experienced be apprehended as passing into one another can Time be grasped, and in this way it is grasped as a continuum.¹ Time as conceived is unlimited in character, is regarded as infinitely divisible

¹ Kemp Smith, *Prolegomena to an Idealist Theory of Knowledge*, p. 83.

and mathematically continuous like an infinite series. Further, it is looked on as involving an objective order of before-and-after, which is not to be equated with the past, present, or future of a subject. This has unfortunately led some idealist critics to claim that past, present, and future are merely subjective and illusory distinctions which show the inherent self-contradiction and unreality of Time. This, however, is due in part to carelessness in the construction of the concept and to a failure to refer to our actual temporal experience in perception. Conceptual Time is also conceived to be a unity in spite of the difficulty of ascribing to it any principle of coherence. Perceptual time, however, is rooted in experience and professions of unity are not made in regard to it. There may on this level be many unrelated times.

There may be many temporal processes (on the subjective level, as many as there are persons), but there is only one Time, which results from the correlation of the many processes. All stages of processes which exist together are correlative. If we ask what events are contemporaneous or simultaneous with a given event, we ask, in effect, what other events exist. The totality of co-existing events constitutes a moment or "now". It matters not for this purpose *how* we determine this co-existence, whether by observation, memory, or scientific method based on inductive principles.¹ The idea is the same; co-existence implies correlation in time, and this time is one.

The Concept of Time is a construction by us by analysis, synthesis, and abstraction. The validity of the methods by which these three operations are carried on may be disputed and the Concept of Time revised. What cannot be so disputed is the nature of perceptual time. Our awareness of time arises from experience, and it is essential to examine the nature of that experience.² The problem of the Nature of Time (as we have

¹ We observe directly many visual, auditory, and other sensations as co-present. We remember certain co-existences of events in the past which we may not have intimately associated together in time at the time, and by inductive methods we infer co-existences not directly perceived.

² The problems involved in the examination of our perception of time have been concisely stated by Piéron in his report to the Seventh International Congress of Psychology (published by the Cambridge University Press, 1924), pp. 98-119. see also Janet's three volumes of recent Lectures, *L'Evolution de la Mémoire et de la Notion du Temps*, 1928.

urged) is finally *metaphysical* rather than psychological, but *within its limits* the psychological investigation is valid. We must look into it before passing to the wider and more fundamental standpoint of the metaphysician.

The psychologist is not concerned with the metaphysical problem of how Time itself comes to be, but, assuming the validity of the percept and the concept Time, he asks how the individual comes by it. The metaphysical and the psychological points of view differ quite conspicuously. If the metaphysician remarks, after the manner of Kant, that the knowledge of Time is given *a priori*, and that any knowledge is impossible without it, then the psychologist will very pertinently reply: "Yes, *a priori* if you will, but only in relation to a Theory of Knowledge, only *epistemologically a priori*, in the sense of being a presupposed concept of all knowledge or science." It is not psychologically *a priori*. Our experience of time grows indirectly through our awareness of events and through our perception of changes. We perceive, not merely that things have changed, but we have a distinct perception of their changing. The experience of change, however, is more primitive than the perception of time, and does not necessarily imply perception of time. Our experience of change is immediate and ultimate, for all our sense-data are changes present to us as events. We have already noted the ambiguity of the term change and that its fundamental meaning is that of the becoming of events, not merely change of place, or of quality, or pastness replacing presentness. Though our experience of time is invoked in us through sensations, it does not follow, and is not the case, that it is directly apprehended by the senses, as, e.g., colours are apprehended.¹

Our experience of time, like that of all else, comes by learning. The awareness of Time arises from a fundamental and irreducible experience, and this we must recognize whatever *metaphysical* theory of the nature of Time we adopt. It develops with the mind, and research has shown that there is no constant appreciation of time (or no natural unit of time) as an

¹ Alexander and Kemp Smith assert that our awareness of time is achieved by intuition. Kant's intuitions and those of Alexander are based on and furnished by sensations, but Kemp Smith's intuitions are independent of sensing and are obscure and unnecessary. Kemp Smith, *Prolegomena to an Idealist Theory of Knowledge*, pp. 80-4.

a priori condition of our knowing the external world. But as we come to know that world of events our sense of time grows; we perceive time (at least indirectly), and erect a Time concept. Great differences in this development are found between different persons and different civilizations and between the same persons at different stages of life.¹

There is no reason to believe that any single individual has a completely unified time. The popular belief in one time is a belief in a neutral-clock convention for social purposes, but this artificial synchronization does not preclude the existence of several time-systems. Variations may arise in certain circumstances and under certain conditions, as the Theory of Relativity shows. Simultaneity, for an observer on a train, is different from that of an observer on the platform. Perceived time is not necessarily unitary, and psychology as well as physics can show individual time-systems peculiar to individuals in special circumstances or under special conditions.²

The most fundamental temporal experience is awareness of an event (a happening, or the existence of an object). Apart from events we could not be aware of time, for there would be no time. For this and other reasons the doctrine of Absolute Time is rejected.

We are also aware of the event as having some duration (however brief). This usually is succeeded by some other event, and the element of succession in duration arises. The before-and-after relation of objective change and of time thus becomes grasped. All our perceptions are not, as Kant claimed, successive, for in addition to succession and duration, we experience simultaneity. This occurs in simple form when two events together affect the same sense organ in such a manner that there is no succession, no priority of one over the other. In more complex manner they may affect two or more organs,

¹ In the development of the child's mind the consciousness of time comes later than the consciousness of space. The child lives, like all primitives, in the present and is interested in things apart from their relations in time. The child is made conscious of time and its significance when it is forced to *wait* for a desired object. See also discussion of this point by Spencer in Chapter IV, p. 150.

² The nature of dream-time is a problem in itself. Even if the *tempo* of this is extremely rapid, it must be remembered that it does not seem so to the dreamer. However "rapid" the dream, he does not feel the sensation he gets from a quick-motion picture. Cf. Sturt (Miss), "Judgment of Time in Sleep" (*Proc. Seventh Intern. Congress of Psychology at Oxford, 1924*), also her *Psychology of Time*, p. 145.

and, of course, one event may do this. Only later, when we come to know the properties of light and sound and their relative speeds, do we realize that one event may involve happenings which do not become known to us simultaneously but successively. This is so in the case of the flash of a gun and its report; also we know that an observed occurrence on the sun must have happened there eight minutes ago. We make our calculations to meet these apparent discrepancies, and so aim at solving Kant's problem of determining the objective order of events as distinct from the order of our perceptions.

Again, all events in our experience are organized in relation to the experiencing subject. Omitting cases of dual personality, we relate events to one unified life history. We do not keep our auditory experiences separate from our visual experiences; they are blended in one.¹ From the subjective standpoint of our own present we extend our time-concept from the primitive consciousness of before-and-after to include past, present, and future. But the past is not *our* past. Bergson has confused the memory of the past with the objective past.²

In the formation of the conception of the past memory enters into play.³ The present is perception; the past is revived in memory images. A creature with no memory could only know the duration of its specious present. It could not have an awareness of its past in any true sense. Memory, coupled with familiarity and attention, gives us our sense of the past. That past may not be ordered in a temporal series. Memories may be retained, but they are not necessarily in a time-order. This has a utilitarian value and makes for greater *souplesse* of mind. Idiots with rote memories cannot apply their memories without recounting them all in serial order. This limits the working

¹ Formerly the lower animals may have done this, as Fouillée suggested in Guyau's book, *Genèse de l'Idée de Temps* (Preface).

² Alexander points this out against Bergson, but is not himself quite free from this confusion. It occurs also in Burt's paper, "Real v. Abstract Evolution", *Proceedings of Sixth International Congress, Harvard*, 1926, pp. 168-77, especially p. 175.

³ Of course, the great bulk of our knowledge of the past is due to historical record. Memory can only give us that fraction which can be revived by a person now living. Reminiscence cannot take us far back. This, however, does not lessen the importance of memory. Most of the historical chronicles were themselves based on the reminiscences of contemporaries. Hence (although memory itself must be distinguished from the perusal of recorded memories written down, and the past kept distinct from *our* past as remembered) memory is at any time a basic factor in building up knowledge of the *near* past.

of such a mind and is too clumsy to be useful in practical affairs, where the direct and often immediate application of past knowledge is essential. The normal mind, however, is able (in greater or lesser degree, according to mental ability) to apply readily the knowledge of the past to the demands of the present without necessary reference to past order.

The conception of the future comes after that of the past. It is a higher stage of development, involving imagination, expectation, and purpose (aided, it may be added, in some degree by memory). The rise of the sense of the past and of the future is thus utilitarian and subjective.

The organization of a general conventional time scheme has, of course, been the work of centuries, and while the modern city dweller is annoyed if his watch loses a few minutes per day, some primitive people remain devoid of any organized calendar or method of counting time.

Psychological investigators in recent years have devoted considerable attention to the growth of the awareness of time as the mind develops. Burt, the psychologist, laments, in his examination of the intelligences of school-children, the great difficulty which they show in making time syntheses of any kind. Ballard and Binet have studied the same problem. Foreign investigators like Decroly, Degan, Stein, and Preyer have devoted much attention to the development of the time-sense, while two English investigators, Miss Sturt and Miss Oakden, have given detailed attention to this question. Their conclusions show that the sense of time-perception before the age of ten is very primitive, like that of savages who have no calendars and practically no historical perspective. A grasp of time appears later than a grasp of space.¹

¹ Oakden and Sturt, "Development of the Knowledge of Time in Children", *British Journal of Psychology*, April 1922. Also M. Sturt, *The Psychology of Time*; and Brunschwig, *La Causalité et L'Expérience humaine* (Le Champ temporel), p. 508. At the Oxford Philosophical Meeting (July 1925), Dr. Ivy Mackenzie, from the standpoint of the biologist and psychiatrist, contributed a paper on "The Biological Sense of Time". Derangements of the time-sense in relation to such affections as amnesia and sleeping sickness were quoted. The lecturer acclaimed a belief in an organic immeasurable personal time, bound up with the continuity of individual experience, as being, in fact, "the binding element in the creation we know as *personality*". The Chairman, Dr. J. S. Haldane, quoted personal experiences of the effects of barometric pressure and of carbon monoxide gas as showing the close relation between a sense of time and the normal consciousness or healthy personality (*Philosophy and Metaphysics*, Symposium of Papers at Oxford Meeting, p. 102).

Our estimates of the duration of time are extremely liable to error. Some psychologists (like Münsterberg, for example) have considered that any accuracy attained in the estimation of short time intervals arises from our awareness of certain physiological rhythms such as breathing, heart beats, but others, like Woodworth, disagree altogether with this, for good reasons. In any case time can be estimated independently of counting.¹ Any estimates of the length of a period of time involve attention to and reflection on the succession we are experiencing. If we become very absorbed in the succession of experiences we forget all about time. When we do attempt estimates, however, we are influenced partly by (1) the number of events happening in the period and their pleasurability, interest, or monotony; (2) the concentration of our attention on time itself during the period; and (3) the unity or diversity of the matters involved. Full and pleasant time seems long in retrospect, short in passing, while boring periods, long to live through, are mercifully short in retrospect. Janet has directed attention to the observed fact that the days, months, and especially the years, seem shorter as we get older, and explains this as due to their porportion to the length of life already lived.² Our memory-perspective of time depends on the totality of impressions received and registered. A period of interest contains events or things that have held our attention, a period of tedium contains little beyond our own awareness of our ceaseless adaptations and expectations which are being continually balked, as in "waiting for the end" of a lengthy and dull sermon or wearisome lecture. We find variations in the perception of time between different organs and between individuals, also between the same individuals in different situations. Time for some in certain situations may appear to drag heavily, while with others it may fly, and even for some, like mystics and lovers, who are alike in having minds wholly rapt in the contemplation and appreciation of their object, it may become (for them) non-existent. They are not, however, actually out of Time; they are merely unaware of it.

Ward considers that our distinction of past, present, and

¹ See discussion on Kant and counting (Chap. IV, p. 91). Alexander considers that counting involves time, but this is another point.

² It was Paul Janet who suggested this. See comments on this by Pierre Janet in *L'Evolution de la Mémoire et de la Notion du Temps*, p. 515.

future arises from the waxing and waning of images from the central point of the vivid present, coupled with the "temporal signs" which are, in his view, based on attention. "Psychologically regarded, the distinction of past and future . . . depends (1) upon the continuous sinking of the primary memory-images on the one side and the continuous rising of the ordinary images on the other side, of that member of a series of percepts then repeating which is actual at the moment; and (2) on the convenient adjustments of attention, to which such words as 'expect', 'await', and 'anticipate' all testify by their etymology".¹ Yet this alone might leave us with the opinion that a distant, vivid representation was nearer to us than a faint present one. The intactness of memory alone can remedy this. It must register the order of events. Where it is weakened the perspective of distant events may be entirely lost and the events seen in a past which is on one plane. There does seem to be a tendency of this kind in each of us, so that the perspective is keenly sensed only near at hand. "We can distinctly imagine", said Spinoza in his *Ethics*, "distance of space or even of time only up to some definite limit"—that is, all objects whose distance from us exceeds that which we can distinctly imagine seem to be all on the same plane; so also objects removed from the present by a longer interval than we can distinctly imagine we refer, as it were, to one moment of time.²

Ward endeavours to explain how we arrange the past in a temporal order, by "temporal signs". With each distinct representation there is, he claims, some trace of the movement of attention of which we are aware in passing from one presentation to another. These movements constitute the "temporal signs", and they form, with the representations, our memory-continuum or our past. Yet he confesses that temporal signs alone will not give us all that perspective of our past which, in fact, we do possess. He suggests that distance-effects operate, and that they shade off as we come to think of our more remote past. The French psychologist, Fouillée, in his *Psychologie des idées-forces*, laid unique stress on this latter point. Ward rightly sees that we cannot arrange our memories in correct time-order if mere vividness is a criterion of position in that

¹ Ward, *Psychological Principles*, p. 211.

² Spinoza, *Ethics*, IV. 6.

order. But, on the other hand, it is difficult to see how his "temporal signs" really correct the tendency to arrange the past in order of clearness. Vividness or faintness of memory can be no guaranteed clue to the remoteness or nearness of the event in our past, while with regard to the so-called "temporal signs", these have not the significance Ward gave them. We do not think they exist save in the case of memories very near to the present, and even there the movement of attention is hardly ever itself the object of consciousness, and unless it is so it is not likely to be recalled and so cannot serve as a "sign", temporal or otherwise.

If we relied, for arranging the time-order of the memory-continuum of our past, on mere vividness of images or concentration of attention, then our order would be in nearly every case utterly wrong. We recall our memories and arrange them in a time-order because we relate them to our interests and our purposes. In the act of bringing to remembrance our past we work back along these lines (references to ends), and by additional reference to dates and to space we verify the order of events. Our difficulties in recalling events in time-order mainly arise when there is no single purposive line of activity with which they are connected.¹ It is by reference to ends of activity and schemes arising therefrom, not by reference to vividness, to so-called "temporal signs" or to movements of attention, that we arrange our memories in temporal order. Our representation of time is usually, as Guyau, Taine, and Ribot all claimed, in terms of visual images referring to space, but although common, this is by no means universal. Even the lineal representation of time involves reasoning and conscious arrangement as well as visual imagery, while auditory and motory images are also invoked. It is not true, however, that *only* the relation of cause and effect or the concept of purpose will act as a principle of time-order, for *any* apprehended relation between the different events will serve to organize them into a temporal series.

The primary meaning of present, as Ward insists, is "here" rather than "now". It is that before us, *prae-esse*, that over

¹ See Guyau, *Genèse de l'Idée de Temps*, p. 36. But he overstresses the spatial (lineal) representation of the past, as Miss Sturt has shown in her discussion of this point in *The Psychology of Time*. Cf. also Janet in the lectures already cited, *L'Evolution de la Mémoire et de la Notion du Temps*.

against us, *Der Gegenwart, Der Gegenstand*. This does not imply a distinction of present and past. Bare presentation does not imply that consciousness even makes the judgment that "this follows that". The awareness of before-and-after is a further stage. Change may be perceived apart from a time-awareness. The bare perception of change does not give us an immediate perception of time-transience. It is a considerable advance from a mere succession of presentations to the presentation of succession, which constitutes the beginning of temporal experience as such. The awareness of succession involves a certain simultaneity, for representations which were formerly merely successive and were attended to quite successively are represented as together.

We often picture Time as a line, but it must be recognized that pure Time, as length without breadth, is an abstraction. If we present in imagery "the Course of Time"¹ as a line, this can only stand for succession. We need, therefore, another line at right angles to this to represent simultaneity. There is another danger about the line presentation. It only comes true when a sense or direction is given to the line, and it may easily lead us to conceive of the *perceived* present as a mere point, a mere line itself between a past that is gone and a future. Our *perceived* present is not like this, although the objective present is of this character. Our awareness of the present is not by any means an awareness of a point or instant; it is rather the awareness of a certain *length* of the time-line. Let us suppose

A, B, C, D, E, F, G

to represent a series of instantaneous events. As the Universe is in continuous change, if one of these, D, is present, then A, B, C are past, while E, F, G are as yet non-existent or future.² In perceptual experience, however, it is found that our "present" includes an awareness of B, C, D as in succession but as simultaneously "present", even although successive. Some would even claim that E was also contained in some anticipatory manner in this psychic or specious present. We find that our

¹ A poem bears this title, written by Pollok, a lengthy work in ten books published in 1827.

² Carr does not exclude the future altogether from the specious present, but he is not quite clear or convincing about this.

present, as perceived, is not a moving point or instant of objective time, but a moving line, or rather a line whose content is always changing.¹

Meumann, and indeed the whole of the workers, German and other, in the field of experimental psychology, have shown that our sense of the passage or lapse of time is not determined merely by succession.² It is true that our awareness of time is based on events or changes and the succession of these, but in addition we are aware of an endurance element, a feeling of permanence as well as one of succession. In the case of any succession of events we experience a feeling that the series has lasted for a long time or that it has been short. The experience of length or duration of this kind, as it varies immensely according to our mood and our attentive powers or interests, is purely subjective and quite unreliable.

Locke remarked that we call an *instant* "the time of only one idea in our minds without the succession of another". He refers also to our ideas succeeding each other "at certain distances not much unlike the images in the inside of a lantern turned round by the heat of a candle". He adds that probably "this appearance of theirs in train" varies not very much in the mind of a man when he is awake. The whole discussion of this point is rather vague in Locke's *Essay*, but he does seem to have been groping toward a fact which experimental psychology has in recent times established, namely the fact of "indifference-time". Experimenters have found, in estimating very short periods under one second or about that length, that there is a certain period for which the average estimates prove to be correct estimates. This is noteworthy because for lesser periods the over-estimation is very striking, and for longer periods the estimation is notoriously erroneous, being far on the side of under-estimation.

This experience is related to the adaptation of attention. We enjoy a "pastime" which is not too hurried to give us time to accommodate ourselves to it and is not too slow to oblige our attention to wander into impatience by deferring expectation. We style this "optimal time", or "adequate time". The

¹ James, *Principles of Psychology*, I. 629. Stern, "Psychische Prasenzzeit", in the *Zeitschrift für Psychologie*, 1897. As against this compare the remarks of Jevons in his little volume of lectures, *Philosophy—What is it?* pp. 94-5.

² For references to Meumann's work see Bibliography appended to this volume.

rhythm of attention is bound up with indifference time, adequate time or optimal time, and this rhythm appears to have some connection with the rate of our living, literally with the pace of our walk or attention or pulse. Spencer, Baer, Ward, and Vassilieff have suggested that this *tempo* varies in different creatures.¹ If so, even the life of the butterfly may not, from its point of view, be so pathetically short as we are apt to judge it to be from the human end.

If, however, events are occurring to us precisely in "adequate time", so that there is no retrospect and no expectation, we being absorbed entirely in the awareness or enjoyment of the present event, then it seems impossible for us to sense duration, and we have interest continually maintained and attention adapting itself perfectly. We are not then aware of time as enduring at all, for the adaptation of attention will appear to us as merely intensity of experience and not as duration of time. This is our criticism, already stated, of Bergson's *durée*.

Our experience of a period of time is, however, not discrete, not discontinuous, although the plurality aspect of it may be vivid. Berkeley and Locke had tended to speak of the duration of any mind or spirit as estimated by the number of ideas or actions succeeding each other in that mind.² Similarly, Herbart stressed the discontinuous or discrete element in relation to time. For him the central fact was the concentration of attention on some single impression. This, however, overlooks the durational element in time and fails to give any account of intervals between the successive adaptations of attention. There is a continuity in our experience of time which is an essential factor.³ The continuity is perceived; it is not merely conceived as in the formal conception of Time which, by overlooking the intensity and concreteness of our temporal experience, regards it as infinitely divisible. Experience shows that each movement of attention has its own particular intensity, and each movement of attention is, for us, temporally regarded a

¹ Spencer's reference to this is given above in Chapter IV (p. 150). Baer discussed it in a lecture, *Welche Auffassung der Natur ist die richtigste*. Vassilieff raised it in his Harvard Paper, 1926, *Proceedings of Sixth International Congress*, pp. 65-74.

² Berkeley, *Principles of Human Knowledge*, I. 98. Locke, *Essay*. Bk. II. Chap. 14.

³ It is interesting to note on this point, as Ward does, the change of attitude made by Wundt, who, after advocating, in common with the Herbartian school, the discreteness of Time, in the first edition of his *Logik* in 1880, advocated continuity, under the influence of Ward and Bergson, in his second edition in 1893.

“moment”. This indeed is the only sense in which we can retain or use the word. A moment, for some, is merely a mental state corresponding with an event; for others it is a class of contemporary, instantaneous events. Objectively there are no moments, but only events. The conventional framework of time, dates, and hours is merely a quick and universal mode of reference. The shortest moment we know directly is the shortest mental state. This is strictly perceptual in character, and time as perceptual is not for us infinitely divisible.

We perceive time; we are aware of it through events. It is true that our consciousness “lives” time, as it were, and has no need to measure it in any other way than by its awareness of its own duration. The measurement of a purely inner sense is, however, grossly subjective, and we find this when we come to compare our own awareness of time or sense of the passage of time with that of others. Then we find that considerable variations and errors arise.

One phenomenon of abnormal type should be noted in connection with this question of time-awareness. Evidence shows that, in the hypnotic trance, the patient manifests a knowledge of time which is often remarkable in its accuracy. It sometimes takes the form of being told to perform an action at a certain fixed time—say an hour hence—and it is performed precisely then. Or, again, it may take the more interesting form of being told to perform an action after the lapse of, e.g., 3,759 minutes, or some large number of seconds, and doing it exactly after this time lapse. The moment may be long *after* the cessation of the trance. In some cases the subject has described his experience as “seeing” the time on an imaginary clock or as abnormal perception of some actual clock at a distance. Cases of this kind point to a curious and obscure power of the subconscious mental life to count time. Accuracy in complicated time-knowledge is, however, like accuracy in dealing immediately with large and complicated calculations, an abnormal condition of the mind. Like all such conditions, it points to certain complex powers hidden away in all of us under the normal functioning of consciousness.¹

¹ This problem is discussed in works on Abnormal Psychology, e.g. F. W. H. Myers on *Human Personality*, Barrett, *Psychical Research*, p. 93. The remarks by Richardson in his *Spiritual Pluralism* (section on Abnormal Phenomena), pp. 272-4, are of interest; also in Mitchell, *Medical Psychology and Psychical Research*.

Dr. T. W. Mitchell, President of the Society for Psychical Research in 1922, has shown in his study of *The Appreciation of Time by Somnambules*,¹ the details of thirty experiments on abnormal awareness of time. Janet had previously noted some "unknown faculty" of measuring time, and Gurney asserted that obscure mental (and not merely physiological) forces were at work in these curious cases. Dr. Mitchell agrees with a previous investigator, Bramwell,² in concluding that the time for performing the act commanded was not arrived at by a calculation—that is to say, the suggestion that a large number of minutes was instantly reduced to days and hours and the *date* immediately fixed for the action is not a true explanation. On the other hand, abnormal powers of mental arithmetic are frequently noted in conjunction with these phenomena, and in these cases dates are arrived at. When Delboeuf, for example, at 6.30 told "J" to pull the cook's nose in 1,600 minutes,³ he might equally well have told her to do so at 9.10 a.m., provided she was able to make the necessary calculation. Mitchell is of opinion similar to that of Janet and asserts that in the true time-appreciation of somnambules we have to deal with a power which, in the present state of knowledge, can only be described as supernormal. It is comparatively easy to understand how a subconscious intelligence may watch the passage of days and count them as they pass, but it is by no means easy to understand how this same intelligence, unaided by any artificial mechanism, such as a clock, can accurately divide "time's continuous flow" into periods which correspond exactly to a given number of minutes. In the normal state we cannot estimate empty time with accuracy save within special limits, and when these are surpassed we have no idea of the length of time passing, yet these *abnormal* cases do seem to indicate an ability to estimate empty time exactly and independently of all external aids of clocks or sensations. The estimates cannot, obviously, be mere guesses; their accuracy precludes that supposition. It seems that many of the patients knew intuitively the exact time of day and also had the faculty of counting minutes in a manner unknown to us, but which *may* be related to obscure organic or mental rhythms. In the

¹ Mitchell, *Medical Psychology and Psychical Research*.

² Bramwell, *Hypnotism*.

³ Delboeuf, "De l'appréciation du Temps par les somnambules", *Proceedings of the Society for Psychical Research*, Vol. VIII, p. 418; for whole case, pp. 414-21.

present state of investigation we can only state the facts, for any theory leaves many facts unexplained, and all this is but an indication that we have much farther to go in the investigation of these data before such obscurities can be explained with any thoroughness.¹

Normally, our awareness of time is bound up with our perception of the transience of events. They happen, then are lost and gone for ever save as recollected by memory. Occasionally, as both Bergson and Bernard-Leroy have shown, we may suffer from illusions of the memory and undergo an experience of a false recognition that a certain event (actually new to us) has happened to us before.² In general, however,

¹ There is a considerable amount of literature in the S.P.R. *Proceedings* on these abnormal cases. Compare with Mitchell, Myers, *Human Personality*, Vol. I, pp. 502-10 and p. 246. Gurney, *Peculiarities of Certain Post-Hypnotic States. Proceedings Society for Psychical Research*, Vol. IV, pp. 268-323. It is there asserted that the vital processes can no more work out such measurements of time than a schoolboy's digestion can work out a problem of Euclid. Bramwell, *Personally Observed Hypnotic Phenomena. Proc. S.P.R.*, Vol. XII, pp. 176-203 (1896), and article (*Brain*, 1900), "Hypnotic and Post-Hypnotic Appreciation of Time". It is there argued that these cases reveal a stratum of consciousness more profound than the hypnotic. Myers confesses that counting days may be comprehended, but how *minutes* are counted baffles him. Beaunis, *Le Somnambulisme provoqué*, pp. 139-41. Royce cites a case (*Proc. S.P.R.*, Vol. I, p. 360) in which patient said he "saw" a clock. Gurney's patients, if questioned in hypnosis between the times, knew how far they had got, and replied, so many minutes gone, so many to go. Münsterberg believed respiratory movements to be the basis of the counting. See also C. S. Myers, *Experimental Psychology*, Chap. XXIII, "Time and Rhythm"; also Edgell, "On Time Judgments", *American Journal of Psychology*, 1903, in addition to papers by Delboeuf and Mitchell already cited.

Pathological cases involving injury to the cortex produce a lack of temporal definition, so that the patient finds no necessary beginning or end to the sensation. A stimulus rhythmically repeated is considered to be continuous. Evidence by Dr. Henry Head in the Aristotelian Symposium on "Time, Space, and Matter" (1919), *Problems of Science and Philosophy*, supp. vol., p. 83.

Certain psychologists have given personal opinions stating that our time-sense has a basis in bodily functions. Some have even placed them, pointing to the semi-circular canals or Corti's fibres as special time-organs. Cf. Cyon, the Russian physiologist, *Das Labyrinth als Organ für mathematische Sinne für Raum und Zeit* (1908). Cf. also Weber, Vierordt (for whom it is a "generalsinn"), Uexküll, and Rawitz, who agree with Cyon. Especially valuable is Janet's course of lectures, *L'Evolution de la Mémoire et de la Notion du Temps* (3 vols., Paris, 1928).

² Bergson, *Le Souvenir du Présent et la fausse Reconnaissance. L'Energie Spirituelle (Mind Energy)*. Bernard-Leroy, *L'Illusion de fausse Reconnaissance*. See the article by Wohlgenuth on "Paramnesia" in *Mind*, July 1924, and his comprehensive bibliography. For Dunne the "déjà vu" arises simply because we have already dreamed about the incident before it happens to us, forgetting the dream on rising from sleep. See also Janet on "déjà vu", Lect. XIV in *L'Evolution de la Mémoire et de la Notion du Temps*, pp. 319-41.

the memory-continuum or train of memories helps us to date past events in relation to purposes.

An event remembered differs radically from an event perceived or an event expected, imagined. An event which we imagine differs from a similar one which we remember by its relation to present impressions and by the active, conative, striving attitude of mind which it promotes. This is strikingly seen in our experience of the repetition of events in a customary series, where we get the gradual fading of the memory images as the events roll on, and ordinary images or impressions change, and attention strains in expectation of future events anticipated. Our knowledge in general and our knowledge of time in particular would be insignificant or non-existent if we did not have recurring series of events uniform in character. The influences of memory and expectation are manifest in our time-experience and in our awareness of our present. The present by itself would strictly yield us continuous preoccupation with impressions, involving our attention throughout, but it would not yield to us an awareness of the present as such. Our consciousness of the present, as present, arises only in relation to our power to look before and after, our ability to recollect and to expect, to pine for what is not (in both senses), what has not survived and what has not arrived.¹

II

The simplest experience of time is probably, as Stout and Janet find,² in the child attitude of "not yet" and "no more". Yet "now" is not a merely artificial line we may draw between a perceived change which is past and one which is anticipated. The moment of experience has a certain abiding quality. Even while time is regarded as a flux, the present is sensed, or perceived as possessing a certain endurance. It does not instantaneously pass away, but possesses some *duration*, some quality of what one might call temporary or relative permanence.

This perceptual experience is well illustrated by what some writers have styled "the specious present", a term apparently

¹ Our past—i.e. the remembered past—involves not merely memory but a definite sense of loss.

² Janet, *L'Evolution de la Mémoire et de la Notion du Temps*, Vol. III, p. 612.

introduced by E. R. Clay and borrowed by James. The relation of experience to time, says Clay, has not been profoundly studied. "Its objects are given as being of the present, but the part of time referred to by the datum is a very different thing from the 'conterminous' of the past and future which philosophy denotes by the name present. The present to which the datum refers is really a part of the past—a recent past—delusively given as being a time that intervenes between the past and the future. Let it be named the specious present, and let the past, that is given as being the past, be known as the obvious past. All the notes of a bar of a song seem to the listener to be contained in the present. All the changes of place of a meteor seem to the beholder to be contained in the present. At the instant of the termination of such series no part of the time measured by them seems to be a past. Time, then, considered relatively to human apprehension, consists of four parts, viz. the obvious past, the specious present, the real present, and the future. Omitting the specious present, it consists of three non-entities: the past which does not exist, the future which does not exist, and their conterminous, the present; the faculty from which it proceeds lies to us in the fiction of the specious present."¹

"In short", says James, commenting on this, "the practically cognized present is no knife-edge but a saddle-back, with a certain breadth of its own on which we sit perched, and from which we look in two directions into time. The unit of composition of our perception of time is a *duration*. . . . It is only as parts of this duration-flux that the relation of succession of one end to the other is perceived."

Succession, simultaneity, duration, are features of our experience of time, and while it appears paradoxical, it is true to the finding of experience that these features *co-exist*. Some duration is implied in the time-process as well as mere flux, and even succession is not incompatible with a certain type of simultaneity—at least in this sense, that two events could not be represented in the mind as in succession unless presented together in a duration. We can perceive one as after the other.

The properties of transitivity and asymmetry which charac-

¹ James, *Principles of Psychology*, Vol. I, pp. 609, 610.

terize the series of events of time are given *with the events*. If in a "specious present" or "moment of experience" I perceive A and B, although I hold both in the unity of that moment of experience as present, I normally know them as A, then B, and know this to differ from the order B, then A.¹

While our experience of time is thus subjective, it corresponds generally to the succession of phenomena. Simultaneity and succession can be features of external events or of sensations. Events and our perception of them both occur in time, and form themselves in a relationship which can be easily understood when the physical and perceptual factors involved are adequately known. "The sensation of the thunder", as Helmholtz has pointed out, "follows the sensation of the lightning just as the sonorous convulsing of the air by the electric discharge reaches the observer's place later than that of the luminiferous ether."²

Various workers in the field of experimental psychology have endeavoured to ascertain the measured length of the specious present, and early experimenters concluded that it ranges between three and twelve seconds. Experiment now gives its range as 550σ to $4,000\sigma$, where $\sigma = \frac{1}{1000}$ sec., i.e., from $\frac{1}{2}$ to 4 seconds. It varies greatly in different individuals, and is much affected not only by intensity of interest and attention, but by fatigue, alcohol, and drugs.³ If this be an indication of "our psychological present", the inquirer will seek to know also what is the smallest time-interval we can perceive. Later on we shall have to raise the question of moments and their reality. We may possibly give them a certain subjective validity as the smallest intervals that we can perceive. "Moments" can be used in this sense. It would be found, however, on investigation, that they would vary, not only as between individuals, but between the various sense-organs of the same individual. The ear, it appears from the results supplied by experimental psychology, has the most discrimination in this respect, succes-

¹ We say *normally* because in cases where the interval is extremely short, the judgment of the order may be and often is wrong.

² Helmholtz, quoted by James, *Principles of Psychology*, Vol. II, p. 628.

³ On drugs and Time-perception see the works of De Quincey, Gautier, Thomson, Beaudelaire, and Morceau de Tours. With regard to length of the "specious present", Janet says not much importance attaches to it, varying as it does so subjectively in proportion to attention, activity, and sentiment in the individual.

sive sounds being distinguished where the interval between them was only one five-hundredth of a second. We cannot perceive very short time-periods. If two ticks of a clock are separated by about one-hundredth of a second, we hear them as one; for us, in practice, time can be no further divided.¹

Our time-experience does involve *more* than mere succession. Time as perceived is not merely one instant replacing another. "Philosophers", said Reid in one of his *Essays on the Intellectual Powers*, "give the name *present* to that indivisible point of time which divides the future from the past." It is just this notion which the idea of and experience of the specious present contradicts. The present as perceived is not an imaginary line, a mere knife-edge between a past which has entirely gone and a future which does not yet exist. The perceived present is actual, concrete, living, and to some extent enduring or extended. It is always an *amount* of time.

From the point of view of mathematics the present is a point without duration; it is the last instant of a series going back into the past and first of a series extending into the future. But from the point of view of psychology the matter is very different. The present is essentially a duration, brief, but having an extension in time, a breadth of a temporal character. The moment of experience or the specious present is always a definite slice or span of duration.

Reid endeavours to supply some close analysis of our experience of time, and he succeeds in combating the notion that out of non-durational units any experience of time as duration could ever be perceived. On the other hand, he does not himself accept the specious present, but rather suggests that the true present has no duration and that motion or succession is *not sensed* by us, *not perceived*; it is only inferred by the operation of memory.

This is an important point because the whole idea of duration as expounded by Clay, James, Bergson, and Ward rests upon the fundamental and vital distinction between memory and perception. The "specious present", the felt "*duration*", is

¹ Experiment now gives 700 σ to 800 σ as the correct indifference time. $\sigma = \frac{1}{1000}$ second. Shorter intervals are overstated, longer ones are understated. There appear to be certain intervals which can be estimated better than others, and, as these are separated from each other, this points to an obscure rhythm-sense about which we know little.

really *sensed* or perceived and not merely remembered. Its contents are sensed *together* in a present duration even while successiveness is experienced.

This has been realized by no one more clearly and emphatically than Wildon Carr, who devoted a portion of a valuable address to the Aristotelian Society in the 1915-16 Session on the subject of the *Moment of Experience* to a critical analysis of our experience in seeing a "shooting" star. He disagrees with Reid. "The line is *sensed*, not memorized. The whole series is *within* the moment of experience, and is therefore a present sensation."

Alexander in his "Gifford Lectures" (*Space, Time, and Deity*) issued a note of warning in regard to the specious present, which conception he feared might prove to be "specious" in another and bad sense of that term. He is afraid of the over-emphasis given by Bergson and by Carr to the unitary nature of the path of the meteor or any other moving body. He has to admit, of course, the truth of this, but will not permit an emphasis on this view which would tend to overlook the fact that this motion occurs in space and occupies time. He thinks that Bergson and Carr are unwarrantably afraid of people breaking up movement into discrete moments. Alexander points out that our experience of seeing the meteor is determined by the nature of our visual arrangements, in which the sense-stimuli leave their after-effects along the retina. He expressly recommends that we should distinguish the "broad" from the "deep" present. "The present", he remarks, "always has breadth as including many simultaneous objects. But it has not depth—that is, breadth—in time." It is no wonder, therefore, that we find him then expressing a conviction that the notion of a specious present does not correspond with the fundamental character of our time-experience, and that it rather misinterprets that experience. He confines the use of specious present to the perception of objects which are perceived together or simultaneously. He gives it breadth, but not depth—that is to say, he makes it relate to extension in space rather than to time. Indeed, he almost misses the real point and significance of the specious present, which lies in this: that it does stress, not the mere spatial extendedness of momentary experience (which Alexander is dwelling on for the purpose

of showing the temporal characteristics of space, in accordance with his own Theory of Space-Time), but the extent *in time* of that experience. He bluntly disagrees with Carr by remarking that "the specious present is not present at all but includes within it distinctions of past and present".¹

Alexander is inclined to use before-and-after as synonymous with past-and-present. This is what Carr rightly contests; before-and-after are not to be equated with past and present. Now it is in this distinction that the value of Carr's analysis lies. *A point or instant is not past because it is before another which is present*, nor is it present only when the preceding member of the series is not present. It is present while it remains within the moment of experience.² That moment of experience has duration or is *une durée*, containing elements which are successive, but which are felt as an abiding or enduring present. There is here no distinction of past and present, but only that of successiveness, of before-and-after. The moment of experience is the moment of attention to life, the moment of activity, creative change; it is the *now* within which sensations and actions *are*. In it we both live and know. Carr says that the duration of that moment of experience ends just where memory takes the place of sensation. Memory is quite another matter, being a totally different psychological action. The experience of time is certainly intensified by memory, but we can have it even in the absence of memory.

The consideration of these facts shows us that our perceptual experience of time contains both the element of successiveness *and* of duration. Even Alexander himself is perfectly willing to support this, and indeed sees in the conception of the specious present itself a very necessary reminder that we always apprehend a bit of duration. He thinks that our sensibility to succession is not so great as our sensibility to duration.

Whitehead, in part of his treatment, appears to be an ardent supporter of the view that we always apprehend a stretch of time. He agrees cordially with James that the present perceived is no knife-edge, but in several respects his comments appear

¹ Alexander, *Space, Time, and Deity*, Vol. I, p. 122.

² (Italics mine.) This has been revised and reprinted in the volume *A Theory of Monads* (1922), pp. 123-53. See also McGilvary, "Time and Experience of Time", *Phil. Review*, March 1914. Guyau, *La Genèse de l'Idée de Temps*.

unguarded. In the *Concept of Nature* he speaks as if "before and after" were the same as "past and future".¹ More especially, however, must we criticize his fusion of memory and perception as manifesting a deficient psychological analysis. "What we perceive or experience as present is the vivid fringe of memory tinged by anticipation." He implies that the present is merely vivid memory. Now it is true that perception may include events that in an objective sense are past, but it is ridiculous to claim that memory, because vivid, is equivalent to perception. Even if we hold that a specious present (prolonged) includes events in another sense past, memory could not possibly include the present. It would cease to be memory if it did.

Memory, he holds, is a disengagement of the mind from the mere passage of nature, for what has passed for nature has not passed for "mind". This shows a confusion of the holding of events in a specious present as a prolonged perception, and the retention by the mind through memory, which is a totally different process. Whitehead here appears to show himself as suffering from the *illusion de la fausse reconnaissance*, and by making all our experience "memories" he seems unable to recognize any place for genuine perception.

Our own view is that the doctrine of the specious present is a correct view of our *perception* of time. But perception alone does not give us the true nature of Time and by itself is illusory. The present as perceived is like the stretch of landscape seen from the window of a travelling train in which we are seated with our back to the engine.² We see stretches of country, not infinitesimal portions. Objectively the present is that line of landscape directly opposite the point where we are stationed in the train, an infinitesimal element in a uniformly flowing quantitative continuum. The span of consciousness always includes more than the objective instant. In every specious present at some instant we directly experience something which happened before that instant.³ The question has been raised as to whether the specious present foreshadows the future. Both Bradley and Hodgson, however, have held that the "not

¹ Whitehead, *The Concept of Nature*, p. 72.

² I.e. we can look back over portion of what we have passed, but cannot look forward. Dunne, however, claims that we can.

³ Realists like Laird delight in showing that this is direct acquaintance with former existence.

yet" feeling is a subsequent and intellectual construction, added to the simpler "now" and "no longer". But in regard to the future, it may be said that in minds possessing a vivid power of imaginative anticipation the future would be foreshadowed in the Specious Present, e.g. in perceiving a slate falling from a roof one may vividly anticipate its hitting someone seen standing below. The anticipation, however vivid or true, would not be the equivalent of the event itself. Everything is perceived in a specious present, but the actual objective present is not specious; only the perceived present is of such a character.¹ This is because the world is in continuous change, and what is actually happening is never specious. But our mental equipment and organization is such that it is *perceived* as specious.²

III

In the contrast of the physical concept, mathematical in character, and the psychological concept, purely experiential in character, the metaphysician is not necessarily with the psychologist. In so far as he is a true metaphysician, he will see the inadequacy of the purely subjective and will not simply oppose to the mathematical time the Bergsonian objection that it is not *perçu*. The true metaphysician cannot find in perception an adequate criterion of reality. On the other hand, he will not find it in a mathematical concept which is valid for the physicist. He must frame his own concept of Time and it must be one which has its roots in the process or becoming of the Universe seen in events or change and seen objectively. He must not allow himself to get into a dilemma in which he has to choose between an entirely mathematical concept, on the one hand, and an entirely subjective psychological concept on the other. He must objectively regard reality

¹ Cf. Inge, *Is the Time Series Reversible?* (Aristotelian Paper, 1920).

² Akeley, "The Specious Present and Physical Time", *Journal of Philosophy*, 1925. Strong, "The Genesis of Appearances: (1) 'Sensible Qualities', (2) 'The Specious Present'", *Mind*, April 1926. This is much clearer and more useful than the first article. Cf. also Volkelt in his *Phänomenologie und Metaphysik der Zeit*, s. 30. Cohn, *Theorie der Dialektik*, s. 78; *Voraussetzungen und Ziele der Erkennens*; also Driesch, *Ordnungslehre*.

in a way which does not interest the psychologist, but while he looks objectively at the world he will refuse to formulate a purely mathematical concept in which all qualitative and experiential factors are omitted as unreal. The metaphysical concept of Time is one in relation to which both the mathematical and psychological concepts can be understood after their kind, but they cannot be equated with it. They separately present a false absolute, an abstraction valid within the respective sciences in which they arise, but misleading if in itself put forward as the sole description of reality. The metaphysician is concerned with the whole, and he cannot follow either Minkowski or Bergson in their entire assertions. The concept of Time to which metaphysics leads reveals its nature in relation to the events, the change, the history of the world. The metaphysician does not insist with the physicist only on the *measurable*, and so the Theory of Relativity helps him little in his inquiry into the *nature* of Time, nor can he insist, with the psychologist and subjectivist thinker, only on the *perceived*, and hence the psychological metaphysics of Gentile, the Kantian "inner sense", or Bergsonian *durée* fail equally to satisfy him. Both the physical and the psychological are but partial views of the whole, and their being placed in opposition in no way helps the problem of the nature of Time, but leads to discussions which discourage the formulation of a valid metaphysical concept of it.

We have remarked that we are aware, in experience, of a portion of time, and we come to notice that such portions have a beginning and an end. This is true, but we are never justified in thinking of Time as merely a relation or system of relations. To do so would be to confuse entirely the corners of the frontage of a house with the frontage itself. That frontage is not merely a relation between the corners—indeed, without the frontage there would be no corners. Similarly in regard to Time, the limits of our portions of time are subordinate to, and derive their reality from, the extent of Time of which they are merely the limits.

Time is much more than a relation between points. It is also much more than the *measurement* of an interval. The measurement of intervals of time with which the physicist deals is not the problem of the nature of Time at all, although the physicist

often thinks he has said all that need or can be said about the nature of Time when he has measured certain intervals, or instants. But instant has no meaning apart from Time within which it lies.¹ It is an abstraction, and while useful in mathematical work, it is useless, and even mischievous, in that it frequently leads to the view that Time is made up of discrete instants or is merely the relations between them. This is no more the case than that Space is made up of points. We must never confuse Time with either its limits or its dimensions.

Any event is part of an event which has greater temporal extension. Every event is divisible into events that take less time. Events are, however, always made up of events, not of moments, or point instants, which are not concrete like events, but mere abstractions from the continuous transient process of time. The death of Marat and the death of Charlotte Corday are part of one event, the French Revolution. Time is bound up with events and is never external to them. It is not simply a relation between events, for these relations must fall within larger events. The "one big event" is the history of the Universe or Life of the Absolute manifested in continuous change.

Newton, Leibnitz, and Einstein have been responsible respectively for three theories of Time: the Absolute Theory, the Relational Theory, and the Relativity Theory. The Absolute Theory claims that there is something called Time which exists quite apart from events and which is characterized by a succession of moments. Events are dated by reference to such moments of Absolute Time. The Relational Theory asserts, however, that Time is merely the relations of events and that events date each other, no moments being involved. There is no evidence that moments exist. When events are close enough to each other to come within that span psychologists term the specious present, we can, and do, directly observe the temporal relation between them, and, moreover, we observe it as a quantity or stretch of time. We never observe moments, and as they never themselves do anything or produce any measurable or sensible effects at all, we may well abandon them and the Absolute Theory. Again, if we take any two events which are

¹ Just as a point is within space.

not simultaneous, the Absolute Theory claims that the relation between these two events is a complex compounded out of other relations than merely those which exist between the two events. There is, for example, the relation of the event to the moment of time it occupies.

Events are not happenings which are *at* or *in* a moment of time; they are happenings which constitute the moment itself. Events are the concrete facts which constitute time.¹ Time does not consist of instants or moments, but of the flow of events in a continuous order and process. There can be no natural unit of time, although we may devise units of measurement of time. Events are our only data.² The true spatio-temporal system is not a mere form, but a concrete totality of events.

On the Relational Theory the matter is viewed in a simpler and truer light. The events date each other by their relation to each other, and there is no need to invoke unknowable moments to account for the temporal relation. But, while rejecting the Absolute Theory, we cannot pretend that the Relational Theory is satisfactory. Time is more than merely a system of relations. Time relations are always within Time, and Time consists of the continuous change of the Universe which brings new events into being in a before-and-after relation or past, present, and future. This sequence is a concrete fact, and not merely itself a relation or sum of relations. It is this which alone makes temporal relations between events both possible and evident, and it underlies them all, imparting a definite sense or direction to events according to, not simply our awareness of them, but the objective order of their happening. This order is not merely a relational order which would be reversible; it is a concrete objective order and structure which is irreversible.³ Similar objections can be urged against

¹ The manifold of events is frequently referred to as the "chronotop".

² In spite of J. W. Nicholson's contention in the Aristotelian Symposium about the spectra-unit as a natural unit, and Whitehead's view of time (expressed at Harvard, 1926) as epochal or atomic and related to quanta. Whitehead, however, was unable to offer in this connection any definite time-quantum as a unit. Cf., however, Bohr's remark: "Atomic action may not take place in what we call Space and Time."

³ "There is no intrinsic reason why time should not be strictly reversible and unroll backwards as in some dreams" (Miss Sturt, p. 145). This is nonsense.

those who claim that Time is merely a change in our cognitive relations to events, for this equally overlooks the objective becoming and the definite perception of a stretch of time. Any theory which regards Time as merely a matter of relations is a hopeless attempt to reduce to a flimsy form what is concrete reality. Time is both percept and concept, and we must always remember that while percepts without concepts are blind, yet concepts without percepts are empty. Both the Absolute and the Relational Theory maintain that there is only one temporal relation between any two given events, that each event has a fixed temporal position, and that if they be not simultaneous a certain fixed time-lapse separates them. The Theory of Relativity claims that there is no single absolute interval of time between them. We are not, however, forced, because we reject both the Absolute and the Relational Theory, to regard the Theory of Relativity as the last word about Time, for we have seen that this theory is concerned primarily with problems of measurement and not with the nature of Time. This remains, and always will be a problem belonging neither to physics nor to psychology, but to metaphysics. The metaphysician cannot accept any of the three theories as exclusively true. Equally inadequate, and indeed mischievous, is the preoccupation with our awareness of time which the psychologist mistakes for Time. The two must not be confused. In so far, however, as events are both physical and mental it may be claimed that both physical and mental time are aspects of one Time. If Time is, as we assert, a continuum of events coming into being in a continuously changing present, then the realm of mind and of external nature are both temporal in character. The world is historical or temporal, and in the concept of History the objective content of knowledge and the subjective experiential content enter into a reciprocal relation, and form a unity which has at once both physical and psychological, objective and subjective aspects.

Miss Sturt equates awareness of time and time itself. A moment of time is simply a state of mind! Time for psychology can have no structure! Its structure is that of the events of the universe. Again note the mischief of a purely psychological, subjective view of time. Reference is made by Holt in *The New Realism* to abnormal cases of awareness in which the order of events appears reversed, but this is an illusion of perception.

IV

Time as transient implies the constant, continuous motion of a present. Yet Time cannot be a mere present; we mean more than this by the term. Time involves past and future. It is precisely the relation of the moving present to the whole range of past and future which is one of the main problems in the discussion of Time.

The future, although not given, is not entirely a non-entity; it is the time-realm of possibility, purpose, and unachieved ideal. It is not true to say that Time is the "gnawing of the past into the future". Equally we may say it is the transformation of the future into the past by means of the present as actuality.

We would liken these possibilities to horses on a race-track. The human mind is like the judge on the course stationed opposite a narrow line, the present. The horses which have accidents are the purposes or ideals unrealized through our negligence or deliberate choice between alternatives.

There is a further point. If future events are all fixed, then it is as if we move past the horses, not the horses past us. This is not a conundrum, but a real difficulty which cannot be solved in the present stage of our knowledge. It may never be solved, but confusion at least could be avoided if we were more careful about our terms. The sense of the presistent present, therefore, can be got by either

- (1) The events moving past us; or
- (2) Our moving past the events.

From the standpoint of the experience of the present itself, either of these views may be true, and the status of the future cannot be determined without other considerations. The present is not merely our knowledge of events; it is, objectively, their happening.

The present is real in a manner peculiarly its own and in a sense in which neither past nor future exists. To equate the past, present, and future, as McTaggart and other Idealists have done, is to give us an abstraction in place of the concrete *becoming* or continuous change which is the essence of Time. It is to offer the concept and to ignore the percept.

There is a marked tendency to confine the use of past, present, and future to subjective time, and to regard the before-and-after relation as in itself characteristic of objective, physical time. Some writers would definitely restrict the usage of past, present, and future to mental time. There is much to be said for this, particularly in the case of the future; but even if it be held that past implies memory and future implies anticipation, it is difficult to avoid allowing an objective use of the term "present", even although generally it means present to a perceiving mind. This is because what is capable of being present to a perceiving mind is an event in the objective series of happenings in the external world. Therefore it seems necessary to admit an objective sense to present in the sense of the event actually happening. It must happen in order to be present to a mind, and from the purely objective standpoint it is present when it occurs or happens, whether there be a perceiving mind to witness the event or not.

On this point Russell, in his article on "The Experience of Time",¹ confines past, present, and future to mental time. As against this view, Laird rightly argues for some objective recognition.² Alexander is interesting on the point, and deserves quotation. "Physical Time", he writes, "is a succession from earlier to later. As Mr. Russell points out, the succession from past through present to future belongs properly to mental or psychical time. But so long as we take care to introduce no illegitimate assumption we may conveniently speak of past, present, and future in physical time itself, the present being a moment of physical time fixed by relation to an observing mind and forming the boundary or section or cut between earlier and later, which then may be called past and future. In a manner earlier and later are, as it were, the past and future of physical Time itself."³ This admission is interesting, but not free from the reference to observing mind. Our contention is that objectively an event is present if it is happening. An event so defined may or may not be presented to a perceiving mind. But in regard to objective considerations reference to a perceiving mind has *ex hypothesi* been dropped, and in any case *present* does not mean merely presented. Present means actually

¹ *The Monist*, 1915.

² Laird, *A Study in Realism*, p. 47.

³ Alexander, *Space, Time, and Deity*, Vol. I, pp. 44-5.

occurring, happening. The term present, so far from necessarily involving "presented", is cognate with only two other terms, past and future. Objectively, when we say an event is present we mean it is actually happening, as distinct from events that have happened and are not now in *actual* existence and from events that are not in actual existence and have never been in actual existence. There is an objectivity in past, present, and future which obliges us to extend the terms to the realm of objective time. The relation of before-and-after, if interpreted narrowly, is not sufficient in itself to account for the objective flow of events, for such a relation can be applied to all past events without including what is happening now. We find in objective time an actual transition of events which is at least the germ of our use of past-present and implies a slightly wider concept than that of merely before-and-after. The mere *relation* before-and-after which holds between all past events must be distinguished from the *concrete* sequence of before-and-after which characterizes the passage of time in relation to the concrete present.

The perception of change or transience, with its order of before-and-after, is the basis of belief in continuity of events all of which are either simultaneous or successive. The common order of time is the correlation of all perceived simultaneities and successions, but the intermittence of perception does not break the continuity of the objective sequence of events. Their occurrence and sequence does not depend on our perception. Duration, we must remember, is duration *in time*. In the objective instantaneous present nothing could endure, for there would be no extent of time in which it could do so. Duration implies continuity of events or objects in time. Nothing that is characteristic of life can manifest itself in an instant which possesses no duration.¹ The instant is a limiting notion, like point. All time involves interval, stretch, or duration. Time does not consist of instants or moments, but of the flow of events in a continuous order. Time is absolutely continuous, however it be measured and expressed numerically.

We always perceive a stretch of time and we perceive it as

¹ Cf. Whitehead, in Aristotelian Symposium on Time, Space, and Material in *Science and Philosophy*, p. 45. Inge, *Is the Time-Series Reversible?* Also an Aristotelian Paper, 1920.

transient, as having before-and-after relations within it. But it contains more than this, for a perceived stretch of time is present, while before-and-after is a relation which may and does hold for ever of events in the time-order of the past. Queen Anne died and then George I succeeded. The transience and presentness of the perceived stretch of time are the germ of the sense of the past and the future, dependent respectively upon memory and expectation.

The total past of the World we do not know, even indirectly, as a whole, and what little we do know of it is largely knowledge gained by description, not by acquaintance.¹ The past which we *remember* is only *our* past. The character of the past is fixed. Not all our tears can wash out a line of it. The future has not happened, it is only possible, and our *expectations* in this connection are subjective.² Astronomical predictions do not contradict this, for they are hypothetical, and they assume uniformity and the absence of great and unusual disturbances. We cannot predict any such uniformity universally or foresee new qualities which may arise.³

Time flies, it is said. What is the medium of its flight? Space? Certainly not, for then time would be a spatial object, akin to an arrow or an electric current. If time flies, it is argued, then it is in Time that it flies, so we get the paradox of two times, one of which moves while the other is permanent and unchanging. Plotinus said that events take place *in* Time. If time moves with the events we have the above difficulty repeated. If it does not, then the events must move past a stationary post or frame of reference. This gives us the same paradox, for not only do events move in time, but time itself moves in Time. But we cannot reduce changes in Time to changes of Time. The change which is the change of Time itself is the fundamental becoming which brings new events into the present.

¹ There appears to be a serious confusion of *our* past (as known, remembered, or discovered) and *the* past in Burtt's paper, "Real *v.* Abstract Evolution". Sixth International Congress, Harvard, 1926, *Proceedings*, pp. 168-77, esp. p. 175.

² Even Dunne's forecasts are limited to his *own* future experiences. This is a vital point in his theory.

³ Osty's sensitives foretold deaths by bullets prior to 1914, in the cases of several men killed in 1914-15. They did not foretell a world-war. They could only see, as it were, along the future strands of *personal* histories.

The importance of these considerations must be evident to any student of the Time-problem. They call for very careful attention, especially in view of the recent use made of them by Mr. Dunne in his challenging work entitled *An Experiment with Time*, based upon alleged dreams of the future. Mr. Dunne has had some remarkable dreams and he has written a remarkable book. It is, in fact, two books, one an exposition of a purely empirical character of his dreams and their alleged relation to events experienced later by him but future at the time of the dream, and the other an elaborate and far from sound exposition of serial times leading to the quagmire of an infinite regress of times.

In the first portion of the work he gives his dreams, of which he kept a careful record made immediately upon awakening. Experience forced him to the belief that while many portions of dreams are mere revivals of past events due to memory, other portions could not be so explained. He gives details of dreams several days in advance of the objective happening of the events pictured. In one case the interval was twenty years, but in general it was about three or four days. In every case they were dreams of the future experience of Mr. Dunne himself or of *his* future rather than of *the* future. He claims that these dreams involve no clairvoyance, but a perception by the dreaming mind of the future of the everyday waking mind. Mr. Dunne's dreams appear to have no association with desires or forebodings of fear. Roughly half the content is due to memory and half to the alleged perception of the future. To invoke again our previous image of travelling in the train, Mr. Dunne presumably sits neither with his back nor his face to the engine, but in the corridor! We cannot gainsay Mr. Dunne's experience, although he asks us not to accept it as scientific evidence. It is a matter for further detailed and collective experiment. Arresting as are some of the dreams, such as that of the Martini-que eruption and of reading incorrectly a newspaper report, Mr. Dunne fails to be convincing in his day-dream reveries about the contents of unopened novels. However, a considerable amount of impartial evidence has been collected by psychic research in other places. One of the most remarkable of these cases was that of the Cornish miner who dreamed of the shooting of the Prime Minister Perceval. This might have been

due to clairvoyance, like many of the dreams and visions of the Highland women. The emphasis in Mr. Dunne's case is on the peculiar *time* of the dreams. They are the sort of dreams he would normally have after an event. They occur three or four days *before*.

Prophetic dreams have been heard of before. Osty and Flammarion have claimed to record real prophetic dreams like those of Mr. Dunne.¹ Some dreams have appeared on examination to be mere coincidences, and we never have statistics of those which do not come true.

If the results were, upon general investigation, accepted, philosophers would be faced by a perplexing problem handed to them by the psychologists. For if Mr. Dunne's point be established, what, then, is the Future? Its precise status becomes a matter of practical interest. If the future can be seen even in dream, then in *some* sense it must exist. There seems to be no escape from this, as Mr. Dunne realizes. He attacks Bergson's theory of the future. He might equally well have attacked the view of Broad, who asserts that the future is pure non-entity, *nothing at all*.

Bergson's view, says Mr. Dunne, introduces the totally unnecessary hypothesis of adding to the past by a process of creation out of nothing. This he calls "a very strange proposition and one for which we have no evidence whatever". It is one of Bergson's beliefs that the portals of the Future stand wide open, and that the future is not ready-made. For Mr. Dunne, however, the whole course of events resembles a cinema film which is being shown. The actual picture on the screen is our present, but what is yet to come is already there in the film. He professes to be able to peep into the film ahead and see what is there before it is shown on the screen.

His work is parallel to a remarkable book published anonymously some years ago which dealt, not with the future but with the past. This was written by two English ladies who visited Versailles in 1901 and wrote down carefully their amazing experience of dipping into the past, giving intimate details of events more than a century earlier, events which marked the last days of Queen Marie Antoinette at Versailles.

¹ Osty, *Supernormal Faculties in Man*. Flammarion, *Before Death* (especially last two chapters).

Their book, *An Adventure*, was widely discussed by psychologists at that time. Mr. Dunne's proposition is, however, more exciting. To see past events is, after all, only to see what has happened; and while it is difficult, on any theory of mind, to account for this, it is another matter to see events that have not yet happened. Of course, thinkers are never unanimous with regard to what constitutes acceptable evidence, but if Mr. Dunne's claims were substantiated as features of the dream mind, it would then follow that the future does *in some sense* exist. The events of the future would all be in the film, but not yet unrolled as present happenings. This, of course, is no new doctrine. Determinists have always asserted this, and many theologians have no difficulty in claiming that to the Deity all events are equally present. The theologian then begins to face difficulties which do not trouble the materialistic determinist, who has thrown over belief not only in Deity but in free-will. The theologian usually wishes to retain both, and is faced with an acute problem. If God knows the future, then is its character determined and our supposed free-will an imaginary vain thing?¹ Certain thinkers, both philosophical and theological, have claimed that there is no inconsistency, for God's knowledge is merely the knowledge of what a free agent will do. Can anyone, even the Deity, know what a free agent will do? If his action is known, some would have suspicions of its being free.² Flammarion has argued that "what *will* be" is not equivalent to "what *must* be".³ We would put the point thus: What must be, inevitably will be, but seeing what will be need not involve "determinism" in the sense in which theologians and materialists usually employ this term. It involves determinism only in the sense that what is seen is a genuine future and therefore it *will* be. Further, leaving theological considerations aside, if such knowledge comes to the agent himself, he (if he have genuine freedom) may falsify

¹ Cf. Goethe: "If God knows what I shall do, then I am not free to do anything but what he knows" (*Conversations with Eckermann*, October 3, 1825. Schopenhauer: If we do not admit the rigorous necessity of all that happens by virtue of a causality which compels all events without exception, any prevision is impossible and inconceivable (*Essay on Free-Will*). Schopenhauer is not clear as to whether he means "efficient" or "final" causality.

² Flammarion, *Before Death*, Chap. VIII, "The Sight of Future Events"; Chap. IX, "Knowledge of the Future". This volume is the first of the trilogy *Death and its Mystery*.

the knowledge. We would appeal to Mr. Dunne on this point. If he saw himself in a motor accident a week hence, would he not avoid motors for twelve months at least? But if he did this he would have to admit that what he saw in his dream was a false future, for he would by his action have falsified his own prophecies. But to this objection Mr. Dunne might right-fully reply, "I should never *dream* of such a thing!"

If sensitives "see" any genuine future, then what they "see" must be either:—

- (1) Projected (as light reaching us from a star) from an existing future.
- (2) Projected (as a shadow) from past and present.

If (2) be taken to involve determination of the future by past and present, then the determinist has still to account for events which elapse between the present at the time of the vision or dream and the later present of the actual happening.

Time is certainly not the mere present, and involves past and future. The past is what has happened, the present what is happening now, and the future is what will happen or become present. No event is really present unless it is actually happening, and no event is a genuine future event unless it is definitely going to happen some time. Hence something foreseen which may be and is avoided is not the future, for it never happens, and is therefore never an event at all. The most that could be said of it is that it is what would have happened had we not interfered. But that, whatever it is, is not the future. A Roman augur prophesied the name of the successor of an emperor. This "prophecy" led to the emperor cutting off, next day, the head of the person named. His brilliant future never became a fact; it was only a possibility. Dunne himself appears to struggle with this difficulty, but does not face it frankly.

Whether the dream mind can see the future is a very dubious point, and we wish Mr. Dunne had kept merely to his dream evidence. It is absurd to erect theories on it until more light is thrown on the question. Mr. Dunne is certainly a new kind of prophet, and as such naturally stimulates some kind of interest, but we do not yet know, although we may have strong suspicions, whether he is a false prophet.

A much more serious and critical examination of the question

of seeing or foreseeing future events is that carried out by Osty. His *Supernormal Faculties in Man* is a much more challenging book than that of Mr. Dunne. Osty's "sensitives" appear to manifest what Dunne experienced in his dreams, and in each case the foresight is not of the future in general, but the future of a human being.¹ Osty's evidence is carefully given, and he discusses whence the "metagnomic" faculty, as he styles it, gains its information when exercised in regard to (1) a personality present, (2) a personality distant in space, (3) a personality distant in time (either past or future). Osty is hostile to all facile "spiritist" and theosophical explanations, and pleads for further examination of matters already touched upon by both Myers and Flammarion.² He does not disguise the possibilities of error which frequently arise from subconscious suggestion or direction of the faculty to the wrong person. His evidence, however, cannot be hastily dismissed, and if accepted must involve us in the admission that at least some future events "exist" in some mysterious way not yet clear to us before they happen in everyday life. We should have to abandon views of the future like those held by Bergson and Broad. The future would then be, not a non-entity and not merely *to be* determined, but already in some respects at least given.

The sole value of Dunne's work lies in his statements of empirical fact—his plain account of his own experiences, not his theories about them. When he speaks of an infinite number of dimensions "at right angles", it is not at all clear what he means. His treatment of serial existence is not intelligible. Because a man is conscious that he is conscious is no ground for affirming an observer, the observer of the observer . . . and so on infinitely. However fantastic the theories, his facts remain and with the more careful work of Osty constitute a challenge in regard to the status of the future. If their results be corroborated we can no longer speak of the future as a non-entity. Further, if the "ladies of Versailles" are right, then it is obvious that even the past may exist in ways not fully

¹ Careful comparison of Dunne's dreams should be made with the revelations of Dr. Osty's "Sensitive", M. de Fleurière.

² Flammarion, *Before Death* (English translation). "Knowledge of the Future", pp. 243-322; also previous chapter, "The Present Future", pp. 221-42.

known to us. Time would have to mean the whole of Time, not merely the transient present. We may even have to postulate a World-Soul to whom past and future are both alike known, because Existence *as a whole* is known to it.

The moving present is the essential feature of Time—in fact, Time is constituted by this moving present. We must admit, however, that we apply the term Time to the direction or dimension of this movement. If we did not admit this, then Time would be merely the present, a limitation which is both invalid and absurd. But we need not and should not make further admissions of a specious kind; e.g., it is argued (notably by Dunne) that this movement of the present takes time, and so there must be a second Time, in which such movement is timeable. But this is not valid. Time is only known by events. The moving present is not timeable, for there is no second system of events available. The present which is moving is the present of *all* events. Any second Time is an imaginary absolute, and such a supposition can only lead to the absurdities of an infinite regress of *Times*, a doctrine which vitiates Dunne's book.

The difficulty about the two times, which has led some thinkers into endless and fatal complication about an infinite series of times, arises from neglect to distinguish the two meanings of Time. Time as percept and Time as concept are not the same thing. The specific point to be noticed in this connection, however, is this: Time essentially implies a moving present, and we frequently mean only this by the term "time". Such time is perceptual in character. But we *also* use the term Time to mean the whole range through which such a moving present has moved, is moving, and will move, i.e. the totality of all events, past, present, and future. This usage of the term has to do with the concept. "Time" is correctly applied to both. Obviously Time cannot be merely the first kind of Time, the *present*, but the demands of the case are perfectly well settled when we recognize our usage of the term for the whole range of events through which the present moves (or which move through the present—the difference is irrelevant here). No question of an infinite regress arises, for the one time is perceptual, the other conceptual, and we use the term now for one, now for the other, and also to mean both. It does mean

both, the moving present and the entire range of that present in the past and future. But failure to recognize the difference has led to many absurd and fanciful statements about Time, infinite regresses based on infinite confusions. Mr. Dunne confuses "lines" and "times" repeatedly.

In any case Time cannot be restricted to the mere present; it must embrace past and future. These, it is true, do not exist in the way the present exists, and the future again does not exist in the way the past did and does.¹ Although the past event is not now existent, it was a feature of existence, and the historical truth of its existence is a fact for all subsequent time. Existence in general is not merely *present* existence. As Laird pertinently remarks: "One might wish that European languages, like some Oriental ones, had a tenseless mood, but even a European can see the point. It is true that the past does not exist now, just as it is true that the present did not exist formerly, but existence itself means the whole of existence, not merely present existence, and past events, like present ones, have their determinate place in the determinate series of existence."²

All events, whether present or not, are elements of the time-series, and their position in that series is determined by their happening in relation to other events, and this remains timelessly true, being history. In history the concept of Time is expressed concretely with relation to all past events. Such persons as Marat and Charlotte Corday, Abélard and Héloïse, no longer exist; they are past; but the facts that Charlotte killed Marat and that Abélard loved Héloïse are truths and belong to the record of History and the general total concept of Existence.³

In one strict sense at least past and future do not exist, but the

¹ See our previous comments regarding the point in connection with Reid, p. 77; Lotze, p. 145; and Broad, pp. 289, 300-1.

² Laird, *Study in Realism*, p. 50. Cf. also Volkelt, *Phänomenologie und Metaphysik der Zeit*, s. 114. Cohn, *Theorie der Dialektik*, s. 74-83. Marty, *Raum und Zeit*, s. 207.

³ The truth is, however, always about an event. The event is past and non-existent now, but the truth remains, and even if forgotten the event itself is still involved and is contained in the general concept of Existence. There has been some confusion by writers who fail to distinguish the event from the truth about it, the past from the merely remembered past.

concept of Time involves them both in different ways, and the present is continuous with past and future, which are one continuum.¹ Every event in the past leaves behind it the historical truth that it was. Present existence excludes past and future, for the one is gone, the other is yet to come. But, as Laird points out, existence in general must include the whole and not merely present existence. The past is part of that whole we designate as Existence even although it does not *now* exist. Equally the future is part of this same concept of Existence, for this general concept has no reference to existence at any particular time; it refers to existence as such and at any time, and so is timeless.

Time is an ever-changing present, a sequence of before-and-after objectively given, out of which a relation of past and present and future is constructed, although past and future are relatively to that present, in a sense, unreal. Time is not directly perceived except by events, and our indirect perception of time is an inadequate view of it, hence our concept of Time. But the concept cannot be legitimately divorced from perceptual experience. This concept is bound up with Reality; Time falls within the self-determining whole which is Total Reality. The Universe may be spoken of as in Time only if we are speaking of the Universe minus Time. The Whole is manifested or given as a temporal process, and therefore Time, both in its perceptual and its conceptual character, is in the Universe, not the Universe in Time. A world which had no Time would have no events; it would be one within which nothing happened and in which there would be nothing to do. Time is a real feature *within* the Universe. Time does not create events, but events create Time. *Being* is creative of events and therefore of Time. The Whole itself (and the values associated with it which are true at any time) is not in Time, and we must regard it, in this sense, as timeless.

¹ Bradley, in his *Principles of Logic*, Vol. I, p. 55: "Time and space beyond here and now are not strictly existent in the sense in which the present is."

APPENDIX AND BIBLIOGRAPHY

APPENDIX TO CHAPTER V

THE CHARACTER OF THE MICHELSON-MORLEY EXPERIMENT

It was in 1881 that Michelson began his experiments with the beam of light, using the facts about fringes of interference previously established by Fizeau. Six years later his main experiment was repeated by him in conjunction with Morley. In 1905 the same experiment was carried out again by Morley and Miller with even greater care. These further experiments did but confirm more surely the original results obtained by Michelson alone in 1881. It should be noted that the results were quite opposed to the expectations of the scientists at work, and in view of their investigations on the ether, and the movement of the earth in it, the results disappointed them keenly.

The aim of this delicate experiment was to arrive at a measurement and comparison of two times or of the time-intervals between two sets of events under different conditions. The test was made by allowing a wave of light to pass from one point A to another point B and back again to A, mirrors being employed to reflect the beam or light signal instantaneously. The precise object of the experiment was to compare *the time* the light took to cover the double distance AB, BA when

(1) The line AB was in the direction of the motion of the earth in its orbit.

(2) The line AB was perpendicular to the motion of the earth in its orbit.

The object of the experiment was a comparison of time intervals. It was the intention of the experimenters to ascertain and measure a certain difference which they definitely supposed to exist. Their aim was to measure it precisely.

We may simplify by an illustration. In place of the moving earth let us draw a platform moving through space (we may say, if we wish, through the immobile ether) in a certain direction indicated by the arrow and travelling with a constant velocity denoted by v .

In the diagram (Fig. 1), ABCD is a rectangular platform travelling in the direction of the arrow, S is a source of light, and M_1 and M_2 are two mirrors at equal distances l from S. The mirrors are so arranged that the line SM is perpendicular to the line of motion (XY) of the platform ABCD, while the line from the source of light to the second mirror (i.e. SM_2) is parallel to the line of movement of the platform. Now a flash or beam of light is projected. The light will travel to M_1 and to M_2 and be reflected back to S. The object is to determine exactly the time-difference.

Now if we follow the beam of light which goes in the direction in which the platform is moving, we find that by the time it reaches the mirror M_2 it will have travelled farther than the

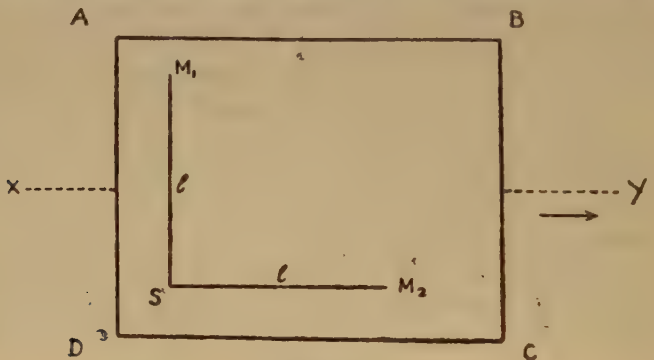


FIG. 1.

distance SM_2 , for M_2 will have moved in the direction of Y and the light will be overtaking it. Let us say it reaches M_2 at t_1 . It will then be reflected instantaneously and return to S, which is moving towards it, thus shortening the distance traversed by the light on its return journey. It arrives back at S at t_2 . If, then, we take c as the absolute velocity of light relative to the ether, then we get the following formulae for the total time taken by the ray of light in its double journey:

$$l + vt_1 = ct_1$$

also

$$l - v(t_2 - t_1) = c(t_2 - t_1)$$

which gives the time as

$$t_2 = \frac{2lc}{c^2 - v^2}$$

A somewhat different case is presented by the ray which goes in a direction perpendicular to the path of the platform. Indeed, we must note that light travelling at right angles will *miss* the moving mirror, which is being carried along like S in the direction XY. The only ray of light from S which can be reflected by M_1 is one which takes a diagonal course. Actually this light ray travels in the manner shown here:

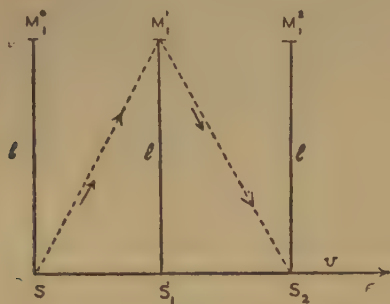


FIG. 2.

the mirror M_1 being equidistant from S and S_2 , i.e. from the point S when the light left it and the point where it is, or will be, when the reflected ray reaches it. In this case we get formulae for the value T_2 , the time taken for the light to travel along the line or lines $SM_2'S_2$. This gives us

$$c^2 \frac{T_2^2}{4} = l^2 + v^2 \frac{T_2^2}{4}$$

from which we get a value for T_2

$$T_2 = \frac{2l}{\sqrt{c^2 - v^2}}$$

This is our time measurement for the case where the direction from the source to the mirror is perpendicular to the line of motion of the platform. Our result or time for the other case where the direction was parallel to the line of movement was different. We found

$$t_2 = \frac{2lc}{c^2 - v^2}$$

Thus T_2 and t_2 are not identical, the two returns to S are not simultaneous, and the difference T_2 and t_2 must be ascertained by the fringes of interference which are revealed when two beams of light travelling from the same source meet again.

Michelson, Morley, and Miller were unable to detect any sign of such shifting. No difference between t_2 and T_2 could, therefore, be discovered.

The sceptic might be inclined to refer to the difficulty of proving the non-existence of such a difference, to the probability of errors of observation, and above all to the possibility of a difference so slight that the observers with their instruments were unable to detect it. For the mind versed in the traditional concepts or even unversed in anything but common sense would consider that there must be some difference in the times taken. It should be noted, therefore, in this connection that the observers were looking for a difference; this was the object of their experiment and they had fully prepared themselves with the most delicate instruments. So delicate were these that they were capable of registering quite clearly a difference amounting to the fraction $\frac{1}{1,000,000,000}$ (a thousand-millionth part). This, be it remembered, was ten times the amount of difference the observers had been led to suppose they would find, arguing as they did on the lines of the classical doctrine of relative motion.

The Michelson-Morley experiment constituted an astounding paradox. Only by grasping its paradoxical nature clearly can we realize its bearing upon the problem of Time, and in a wider manner with which we are not here fully concerned, upon the Theory of Relativity.

We may put the matter simply in terms of several illustrations, about swimmers, barges, or trains. We shall select the last as perhaps clearer. At school we may recollect that we did "sums" about moving trains and the time they took to pass. If a train going at fifty miles per hour passed me, then if I were standing still it passed obviously at fifty miles per hour. If I were on another train, then one of two things was to be done to ascertain the rate of passing. For trains going in opposite directions the rates were added, for those going in the same direction rates were subtracted. That was the rule, and we found that it worked and our "sums" were correct.

But the net result of such work as that of Michelson, Morley, and Miller amounts to this: They tell us that here is an express train which appears to be going just as quickly to observers in a slow train on a parallel line going in the same direction as it appears to observers standing on the station platform. This is the result put in its simplest form and in a way which sets forth the paradox with clearness.

The slow train is, of course, the earth in its orbit; the very fast express moving in the same direction is the light travelling from S to the mirror M_1 . From the difference between the time intervals T_2 and t_2 Michelson was anxious to ascertain the absolute velocity of the platform (i.e. velocity of the platform relative to the ether) in terms of c , the absolute velocity of light. The inability to ascertain any difference between the times 1 and 2, or T_2 and t_2 as we have since called them, negatived such calculation, and we may note that no subsequent type of experiment has been able to show any difference. No effect due to the uniform rectilinear motion of a body through the ether has ever been detected, although it had been predicted and although the apparatus used was quite delicate enough to detect and measure it had it been present. Of course, this negative fact is a basis of the Theory of Relativity.

We must, however, confine ourselves for the moment to a summing up of the considerations arising out of the paradoxical result of the Michelson-Morley experiment which concern technically our problem of Time and its measurement. It will be seen later how vitally these details bear upon the difficult problem of simultaneity and the notion of local or multiple times.

The velocity of light with respect to various bodies (more strictly, "inertial systems", i.e. systems in which the law of inertia as conceived by Galileo and Newton holds good) is the same even although these bodies be moving with various velocities in the same direction as the light or in the opposite direction to it. It matters not whether we for the moment express the result in terms of the Absolute or the Relational Theory of Motion. In terms of the first we may say that, although the earth is moving with an absolute velocity through the ether in the same direction as the light, this does not

diminish the velocity of the light with respect to the earth, for everything goes on as if the earth were really and absolutely at rest in the ether. On the other hand, in terms of the second theory, the relative velocities of the wave of light with respect to a number of bodies which are moving relatively to each other in the same direction as the light are, nevertheless, the same.

In order to be perfectly clear in regard to the nature of the experiment and the highly important interpretations of it which have been offered, it is worth while to notice the assumptions made by the experimenters before their work and by later thinkers who have endeavoured to explain it.

1. That the absolute velocity of light is the same in all directions through "the ether".

On this it may be said that, if the contrary were true, it could only account for the discrepancy at one time in the year when the earth would be moving in a certain absolute direction. This would be totally inadequate to account for the facts of the experiment.

2. That the fact that a source of light is itself in motion can make no difference to the velocity of light.

Regarding this assumption, it may be pointed out that it could only be questioned if the corpuscular theory of light held the field. Then it might be urged that a movement of the source accelerated the projectile on its way. On the wave-theory of light (formulated by Huygens) there is no ground whatever for claiming that motion of the source of light can make the slightest difference to the speed of the light.

Michelson and Morley concluded that "the ether" must be carried on completely by the moving earth. This conclusion, however, contradicted experiments which prove partial connection¹ and contradicted some important work done by Lodge in 1892 with regard to the velocity of light in proximity to

¹ Cf. Freundlich, *Foundation of Einstein's Theory of Gravitation*. Professor Erwin Freundlich is one of the most brilliant of the younger astronomical adherents of Einstein in Germany. He is connected with the Astro-Physical Observatory, Potsdam, and is Director of the Einstein Tower. Freundlich's *Theory of Relativity: Three Lectures for Chemists*, p. 41; and Born, *Die Relativitätstheorie Einsteins und ihre physikalischen Grundlagen*, p. 166 (English translation, p. 184).

rapidly moving bodies. As a matter of fact, "the ether" is not dragged along by the earth or the platform in its course. Facts in connection with the aberration of the fixed stars in relation to the movement of the earth in its orbit point to there being no dragging of the ether, possibly no ether to be dragged.

Fizeau, Hoek, and Arago found, in their experiments with light passing through a moving medium, that there was no dragging of the ether. Fizeau made a comparison of the two time-intervals when a ray of light is passed through standing water and when that same light is passed through water moving in a stream. He found that light travelling with the current has its speed increased by an amount proportional to the speed of the water itself. The increase is not equal to the speed of the water; it is less than this, but is proportional to it. Similarly, in the other case, the speed of light is retarded proportionately, and Fizeau was able to formulate his "dragging coefficient" and expressed his results in certain equations based upon his own measurements.¹ In the case of the Michelson-Morley experiment, however, there was no dragging of the ether.

In 1908 Ritz denied the truth of the statement that light travels with a velocity which is quite independent of any movement of the source of light.² This, however, although an attempt at explanation, was untenable in view of the results of Arago, Hoek, and more recently, in 1913, of De Sitter, whose experiments all proved that the velocity of light from the fixed stars is entirely independent of the motion of these stars.

With regard to the problem of the ether, which had been the primary consideration of Michelson, its fate seemed sealed. The matter has been tersely put by Born, who keeps up in physics the reputation of his University of Göttingen, which previously held the brilliant mathematicians, Gauss and Riemann, whose work had considerable influence on the

¹ These equations, it is interesting to note, were subsequently deduced by Einstein from his own formula as a simple case of contrast of time when light is propagated through a moving medium.

² Ritz was a brilliant young Swiss physicist who died in 1909, at the early age of thirty-one. Carl Benedicks, in his *Space and Time*, pays high tribute to his work and his emission theory of light.

whole development of these doctrines prior to Einstein. "If", says Born, "each of two observers who are moving relatively to each other can assert with equal right that he is at rest in the ether there can be no ether. . . . From now onwards ether as a substance vanishes from theory."¹ Einstein, indeed, used the word for empty space and gravitational and electromagnetic fields, but this is not the traditional usage of the term, and certainly is not the "ether" of which those speak who refer to "motion relative to the ether", a phrase which is devoid of meaning in relation to Einstein's theories. We are not, however, vitally concerned with this aspect of the Michelson-Morley experiment, which still remains a conundrum of physics, and opinions differ both as to its validity and its value.

The suggestion that the reflections of the light rays in the mirrors affected the result was irrelevant, for even if some infinitesimal time *were* taken in the act of reflection this would be equal for the two mirrors and so could make no ultimate difference whatever. It should also be borne in mind that the experimenters in the Michelson-Morley experiment were in quest of a *differential* result.²

Some explanation of the curious anomaly of the results given by the Michelson-Morley experiment had to be forthcoming. One explanation was proposed and taken up and elaborated by Lorentz of Leiden and by Fitzgerald of Dublin in 1892. It was suggested that any moving body undergoes a *contraction* of length in the direction of its movement.³ Experimental work by Fizeau and Foucault points to an establishment of the same theory. This principle may be expressed in general terms.

Let us suppose S to be a motionless system and S_1 a counterpart of S but one which, after coinciding with S , moves away from it in a straight line with a velocity v . Then, in accordance

¹ Born, *Die Relativitätstheorie Einsteins und ihre physikalischen Grundlagen*. Dritte Auflage, ss. 170-1. An English translation of this interesting and valuable book has appeared (English translation, Brose, pp. 189-90).

² Freundlich, *Foundations of Einstein's Theory of Gravitation*. English translation, pp. 34-6.

³ Born refers to this hypothesis as "bold and crude": "Die durch ihre Grobheit und Ruhnheit überraschende Hypothese lautet nun einfach so Jeder Körper . . .", in *Die Relativitätstheorie Einsteins*, s. 168.

with what has already been stated, S_1 (in so far as material) will contract in the direction of its movement. The new length will be to the old in the proportion of

$$\sqrt{1 - \frac{v^2}{c^2}} : 1$$

This means further that Time on S' will undergo a prolongation; it will flow more slowly. An observer on S looking at S' and fixing his attention on a second of a clock on S' at the moment of *dédoublement* would see the second of S lengthen itself out on S' like an elastic thread. This phenomenon has nothing in common with the lengthening of a balance, for no change occurs in the machinery of the clock or its working. *It is not because the clocks go slower that the Time is lengthened; it is because the Time is lengthened that the clocks go slower.*

In consequence of this dilation of Time the new second of Time will bear to the old the proportion of

$$1 : \sqrt{1 - \frac{v^2}{c^2}}$$

Further, there follows a more revolutionary consequence. For events which on the system S were *simultaneous* become in system S' *successive*. This does not apply to events contemporary in S which are situated in the same plane *perpendicular* to the direction of motion. These will still be contemporary in S' . Any other two events contemporary in S will in S' be separated by $\frac{lv}{c^2}$ seconds of system S' , where l equals distance counted in the direction of movement. These changes of time-length and the conversions of simultaneity into succession which occur on the system in motion are observable by those on the stationary system, but those on the moving system itself are quite unaware of them.

The suggestions of Lorentz in regard to contraction and real length have been expressed in equations which serve to transform the relations of events in the moving system into terms of these in the immobile system and vice versa.¹ These

¹ As early as 1877 Voigt had similar ideas, while in 1900 Larmor, and in 1905 Poincaré, indicated similar transformations.

equations secure the invariancy for all inertial systems of the fundamental equations of electro-magnetics and incidentally show that no observed velocity can be greater than that of light, for all additions of any velocity whatever to that of light give invariably the same constant.

THE POSITIVE RESULT IN THE MICHELSON-MORLEY EXPERIMENT

More recently the experiment has been repeated at Mt. Wilson, and a *positive* result obtained after 1,600 measurements in 35 different sets. In view of this it becomes impossible to erect any theory on the experiment until it be further investigated and its precise conditions be examined critically and repeated to permit of its establishment. The present position is, as Eddington and Dantzig have remarked, most confusing for physics.¹ We would suggest also that more must be done in the investigation of the nature of light. Philosophical theory must here wait on the further findings of physicists, and especially their final findings about this experiment, which was so paradoxical in its first negative results.

The *positive* result has not been generally accepted by physicists, and the experiment apparently stands as it did originally.

In any case we must reckon seriously with the very shrewd criticism of Palágyi quoted in the text of our Fifth Chapter. For him the whole conception on which the experiment is founded is illegitimate, as it involves adding or subtracting the *motion* of the earth and the *propagation* of light, things which are entirely distinct.

NOTE ON SIMULTANEITY

With regard to Simultaneity, there are now four distinct meanings to the term:—²

1. *Subjective* Simultaneity (in *mind* of observer).
2. *Objective* Simultaneity of three kinds:—
 - (a) *Syntopic* (recorded by camera with revolving film).
 - (b) *Spaced* Simultaneity of *two* kinds.

¹ Cf. Dantzig's article on Miller's experiment in *Mathematische Annalen*, Bd. 26, 1926.

² Cf. Mr. E. V. Miller, "Einstein and Pre-Relativity Physics", *Australasian Journal of Psychology and Philosophy*, September, 1928.

- (b_1) Where only observers *not* in relative motion would agree as to the simultaneity of two given events.
- (b_2) Where not only these, but also observers in relative uniform motion would agree (some call this "public simultaneity"), and this is the Simultaneity which Einstein denies.

These distinctions are of the highest importance.

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